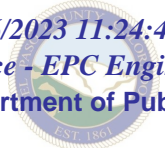




ACCEPTED for FILE  
Engineering Review

06/16/2023 11:24:44 AM

Jeff Rice - EPC Engineering  
EPC Department of Public Works



June 5, 2023

El Paso County Planning and Community Development  
2880 International Circle, Suite 110  
Colorado Springs, CO 80910

RE: The Hills at Lorson Ranch Filing No. 1 (SF 21-010)  
Certification Letter

Dear El Paso County PCD,

Based upon information gathered from as-built surveys and periodic visits to the project, Core Engineering Group is of the opinion that the subdivision improvements have been constructed in general conformance with the approved design plans as filed with El Paso County.

The site and adjacent properties (as affected by work performed under the County permit) appear to be stable with respect to settlement and subsidence, sloughing of cut and fill slopes, revegetation or other ground cover, and the improvements (public improvements, common development improvements, site grading and paving) visually appear to meet or exceed the minimum design requirements.

The sanitary and watermain located in the public ROW has also been completed in accordance with Widefield Water and Sanitation Districts criteria.

In addition, Core Engineering Group has verified in a separate certification letter dated May 4, 2023 that Extended Detention Basin/WQ Ponds C1, C2.1, C2.2, C2.3, C3, & C4 meet the volume and elevation requirements and are constructed in general compliance with the approved construction plans. The pond "as-built" documents are attached to this letter.

Based on information gathered during construction and post-construction, Core Engineering Group is of the opinion that the public streets, storm sewer, and Detention Ponds C1, C2.1, C2.2, C2.3, C3, & C4 have been constructed in general accordance with the approved construction documents.

Sincerely,  
Core Engineering Group, LLC



Richard L. Schindler, P.E. 33997

Attachments: Pond Certification Letter



May 4, 2023

El Paso County  
Planning & Community Development  
2880 International Circle, Suite 110  
Colorado Springs, CO 80910

Attn.: Project Manager

RE: The Hills at Lorson Ranch Filing No. 1 (SF 21-010)  
Private Detention/Stormwater Quality Ponds C1, C2.1, C2.2, C2.3, C3, & C4  
As-built Certification

Dear Project Manager:

Per the approved construction drawings for The Hills at Lorson Ranch Filing No.1 (SF 21-010), improvements were made to construct six full spectrum detention ponds including water quality facility in compliance with the current El Paso County Drainage Criteria and the approved Final Drainage Report for this project.

Based upon this information and periodic site visits by field personnel to the project during significant/key phases of the stormwater BMP installation, Core Engineering Group, LLC is of the opinion that the detention and stormwater BMPs have been constructed in general compliance with the approved design plans and specifications as filed with El Paso County. The Pond C2.2 ratio peak outflow to predeveloped did exceed allowable limits for the 10-year (ratio=1.2, 25cfs) and 25-year (ratio=1.1, 40.3cfs) flows. Pond C2.2 was designed with a downstream oversized storm sewer overflow conveyance system in Fontaine Boulevard for the 100-year storm event and a modified Type D outlet structure to capture emergency overflows. The exceeded outflows will not negatively impact the oversized downstream storm sewer system for the 10-year and 25-year storms. Pond C2.2 flows downstream (in series) into existing Pond C5 located at the East Tributary of Jimmy Camp Creek. Existing Pond C5 is a large pond and the Pond C2.2 larger outflows for the 10-year and 25-year will not have any negative impact on Existing Pond C5 which flows directly into the East Tributary of Jimmy Camp Creek.

Statement Of Engineer of Record

To the best of my knowledge, information and belief, for the referenced project above, the improvements have been constructed in general compliance with the approved design plans and specifications as filed with El Paso County.

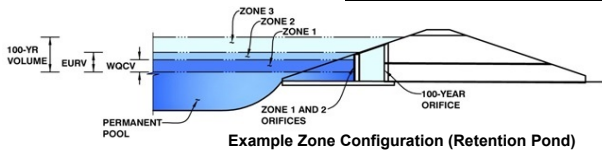
A circular blue ink seal for a Professional Engineer. The outer ring contains the text 'PROFESSIONAL ENGINEER' at the top and 'COLORADO' at the bottom. The inner ring contains the text 'RICHARD L. SCHINDLER' at the top and 'P.E. NO. 33997' at the bottom. A handwritten signature in blue ink is written across the seal, and the date '5/4/2023' is handwritten in the center.  
Richard L. Schindler  
Colorado P.E. No. 33997  
For and on behalf of Core Engineering Group, LLC

Attachments: Pond C1, C2.1, C2.2, C2.3, C3, & C4 As-Built Drawings

# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

**Project: The Hills at Lorson Ranch**  
**Basin ID: Pond C1-asbuilt**



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.70	1.240	Orifice Plate
Zone 2 (EURV)	5.76	2.759	Rectangular Orifice
Z3 (100+1/2WQCV)	7.86	3.393	Weir&Pipe (Restrict)
<b>Total (all zones)</b>		<b>7.392</b>	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =  ft (distance below the filtration media surface)  
 Underdrain Orifice Diameter =  inches

Calculated Parameters for Underdrain  
 Underdrain Orifice Area =  ft<sup>2</sup>  
 Underdrain Orifice Centroid =  feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =  ft (relative to basin bottom at Stage = 0 ft)  
 Depth at top of Zone using Orifice Plate =  ft (relative to basin bottom at Stage = 0 ft)  
 Orifice Plate: Orifice Vertical Spacing =  inches  
 Orifice Plate: Orifice Area per Row =  sq. inches (diameter = 2 inches)

Calculated Parameters for Plate  
 WQ Orifice Area per Row =  ft<sup>2</sup>  
 Elliptical Half-Width =  feet  
 Elliptical Slot Centroid =  feet  
 Elliptical Slot Area =  ft<sup>2</sup>

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.20	2.45					
Orifice Area (sq. inches)	3.20	3.20	3.20					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	3.70	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	5.76	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	6.00	N/A	inches
Vertical Orifice Width =	19.75		inches

Calculated Parameters for Vertical Orif  
 Vertical Orifice Area =   
 Vertical Orifice Centroid =

Zone 2 Rectangular	Not Selected
0.82	N/A
0.25	N/A

User Input: Overflow Weir (Dropbox with Flat or Sloped Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe).

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.23	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	5.66	N/A	feet
Overflow Weir Gate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	3.00	N/A	feet
Overflow Gate Open Area % =	70%	N/A	% , gate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow We  
 Height of Gate Upper Edge, H<sub>t</sub> =   
 Overflow Weir Slope Length =   
 Gate Open Area / 100-yr Orifice Area =   
 Overflow Gate Open Area w/o Debris =   
 Overflow Gate Open Area w/ Debris =

Zone 3 Weir	Not Selected
6.23	N/A
3.00	N/A
9.50	N/A
11.89	N/A
5.94	N/A

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	12.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pl  
 Outlet Orifice Area =   
 Outlet Orifice Centroid =   
 Half-Central Angle of Restrictor Plate on Pipe =

Zone 3 Restrictor	Not Selected
1.25	N/A
0.56	N/A
1.91	N/A

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	10.06	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	28.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.16	feet

Calculated Parameters for Spillway  
 Spillway Design Flow Depth =  feet  
 Stage at Top of Freeboard =  feet  
 Basin Area at Top of Freeboard =  acres  
 Basin Volume at Top of Freeboard =  acre-ft

micropool = 0 = 5743.35

## Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF)

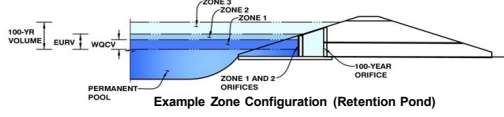
	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =								
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	1.240	3.999	3.772	5.294	6.615	8.338	9.762	11.547
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.772	5.294	6.615	8.338	9.762	11.547
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	4.8	13.7	21.2	39.0	49.1	63.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.07	0.20	0.31	0.58	0.73	0.94
Peak Inflow Q (cfs) =	N/A	N/A	45.6	64.4	78.4	105.4	123.5	145.4
Peak Outflow Q (cfs) =	0.5	6.0	5.0	6.4	14.6	15.7	16.5	17.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.7	0.4	0.3	0.3
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	N/A	0.6	0.6	0.6	0.6
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	48	49	50	49	48	47	46
Time to Drain 99% of Inflow Volume (hours) =	41	52	53	55	55	55	56	56
Maximum Ponding Depth (ft) =	3.70	5.76	5.15	6.02	6.57	7.37	8.06	8.95
Area at Maximum Ponding Depth (acres) =	1.10	1.50	1.42	1.53	1.59	1.68	1.76	1.87
Maximum Volume Stored (acre-ft) =	1.248	4.005	3.115	4.398	5.238	6.545	7.732	9.348

**DETENTION BASIN STAGE-STORAGE TABLE BUILDER**

*MHFD-Detention, Version 4.02 (February 2020)*

**Project: The Hills at Lorson Ranch**

**Basin ID: Pond C1-asbuilt**



**Example Zone Configuration (Retention Pond)**

pond bottom=5743.35

Depth Increment = 0.20 ft

**Watershed Information**

Selected BMP Type =	<b>EDB</b>
Watershed Area =	67.50 acres
Watershed Length =	4,800 ft
Watershed Length to Centroid =	2,100 ft
Watershed Slope =	0.040 ft/ft
Watershed Imperviousness =	55.00% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	100.0% percent
Percentage Hydrologic Soil Groups C/D =	0.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

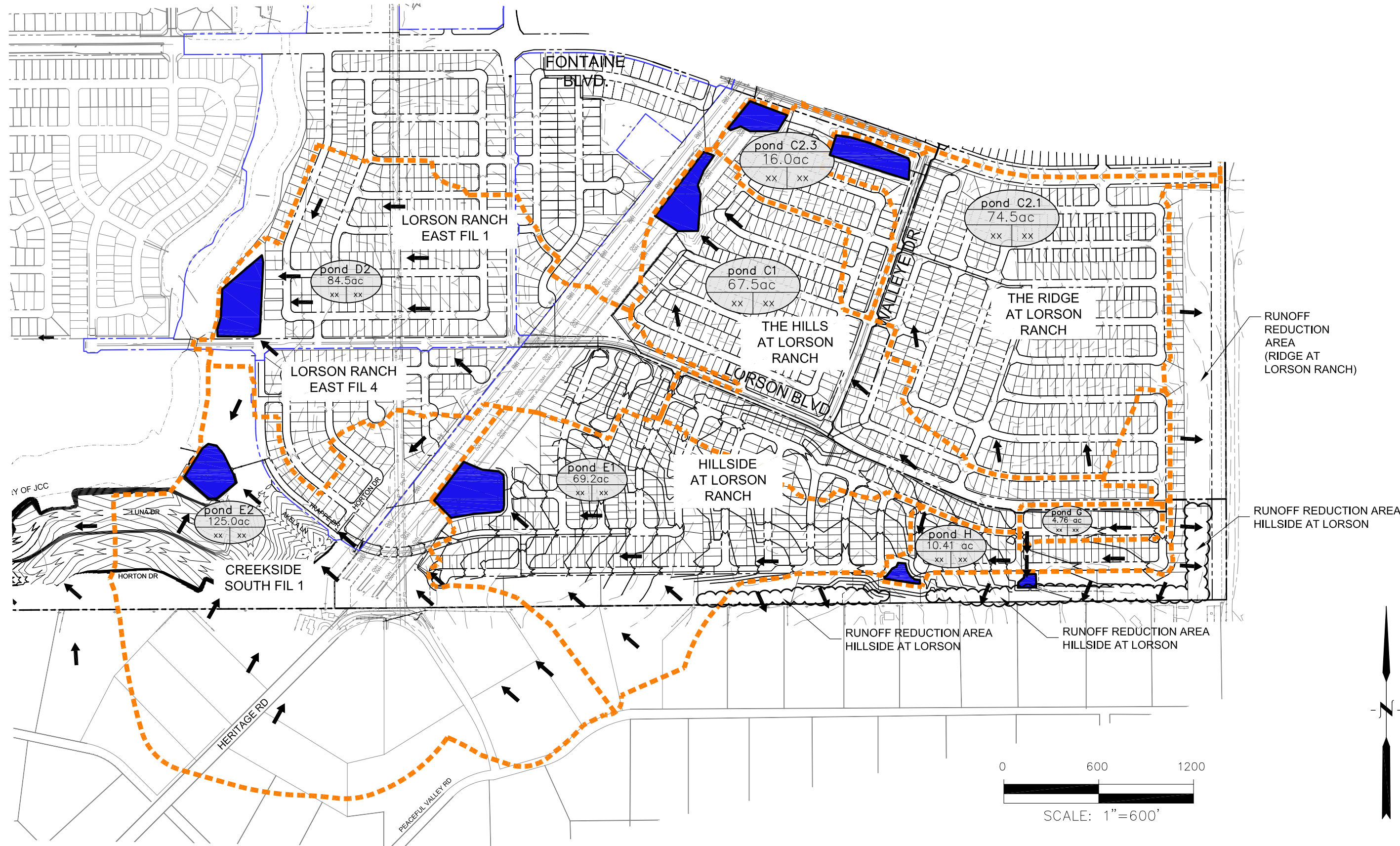
Water Quality Capture Volume (WQCV) =	1.240 acre-feet
Excess Urban Runoff Volume (EURV) =	3.999 acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	3.772 acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	5.294 acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	6.615 acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	8.338 acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	9.762 acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	11.547 acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	15.208 acre-feet
Approximate 2-yr Detention Volume =	3.047 acre-feet
Approximate 5-yr Detention Volume =	4.144 acre-feet
Approximate 10-yr Detention Volume =	5.409 acre-feet
Approximate 25-yr Detention Volume =	5.880 acre-feet
Approximate 50-yr Detention Volume =	6.138 acre-feet
Approximate 100-yr Detention Volume =	6.772 acre-feet

Optional User Overrides	
acre-feet	acre-feet
acre-feet	acre-feet
inches	inches
inches	inches
inches	inches
inches	inches
inches	inches
inches	inches
inches	inches

**Define Zones and Basin Geometry**

Zone 1 Volume (WQCV) =	1.240 acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.759 acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	3.393 acre-feet
Total Detention Basin Volume =	7.392 acre-feet
Initial Surcharge Volume (ISV) =	user ft <sup>3</sup>
Initial Surcharge Depth (ISD) =	user ft
Total Available Detention Depth (H <sub>total</sub> ) =	user ft
Depth of Trickle Channel (H <sub>T_C</sub> ) =	user ft
Slope of Trickle Channel (S <sub>T_C</sub> ) =	user ft/ft
Slopes of Main Basin Sides (S <sub>main</sub> ) =	user H:V
Basin Length-to-Width Ratio (R <sub>L/W</sub> ) =	user
Initial Surcharge Area (A <sub>ISV</sub> ) =	user ft <sup>2</sup>
Surcharge Volume Length (L <sub>ISV</sub> ) =	user ft
Surcharge Volume Width (W <sub>ISV</sub> ) =	user ft
Depth of Basin Floor (H <sub>FLOOR</sub> ) =	user ft
Length of Basin Floor (L <sub>FLOOR</sub> ) =	user ft
Width of Basin Floor (W <sub>FLOOR</sub> ) =	user ft
Area of Basin Floor (A <sub>FLOOR</sub> ) =	user ft <sup>2</sup>
Volume of Basin Floor (V <sub>FLOOR</sub> ) =	user ft <sup>3</sup>
Depth of Main Basin (H <sub>MAIN</sub> ) =	user ft
Length of Main Basin (L <sub>MAIN</sub> ) =	user ft
Width of Main Basin (W <sub>MAIN</sub> ) =	user ft
Area of Main Basin (A <sub>MAIN</sub> ) =	user ft <sup>2</sup>
Volume of Main Basin (V <sub>MAIN</sub> ) =	user ft <sup>3</sup>
Calculated Total Basin Volume (V <sub>total</sub> ) =	user acre-feet

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft <sup>2</sup> )	Optional Override Area (ft <sup>2</sup> )	Area (acre)	Volume (ft <sup>3</sup> )	Volume (ac-ft)
<b>Top of Micropool</b>	--	0.00	--	--	--	40	0.001		
<b>5743.73</b>	--	0.28	--	--	--	52	0.001	13	0.000
<b>5744</b>	--	0.55	--	--	--	150	0.003	40	0.001
<b>5745</b>	--	1.55	--	--	--	2,770	0.064	1,500	0.034
<b>5746</b>	--	2.55	--	--	--	21,585	0.496	13,677	0.314
<b>5747</b>	--	3.55	--	--	--	45,800	1.051	47,370	1.087
<b>5748</b>	--	4.55	--	--	--	58,580	1.345	99,560	2.286
<b>5749</b>	--	5.55	--	--	--	64,110	1.472	160,905	3.694
<b>5750</b>	--	6.55	--	--	--	69,070	1.586	227,495	5.223
<b>5751</b>	--	7.55	--	--	--	74,138	1.702	299,099	6.866
<b>5752</b>	--	8.55	--	--	--	79,338	1.821	375,837	8.628
<b>5753</b>	--	9.55	--	--	--	84,658	1.943	457,835	10.510
<b>5754</b>	--	10.55	--	--	--	90,066	2.068	545,197	12.516
<b>5755</b>	--	11.55	--	--	--	95,546	2.193	638,003	14.647
<b>5756</b>	--	12.55	--	--	--	99,580	2.286	735,566	16.886

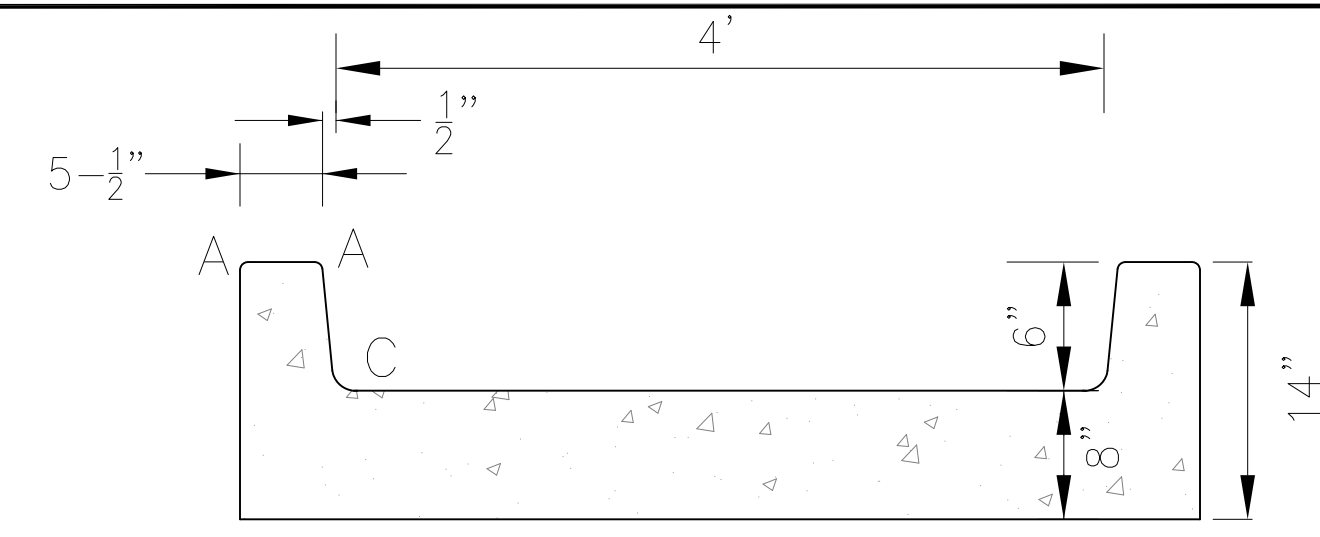
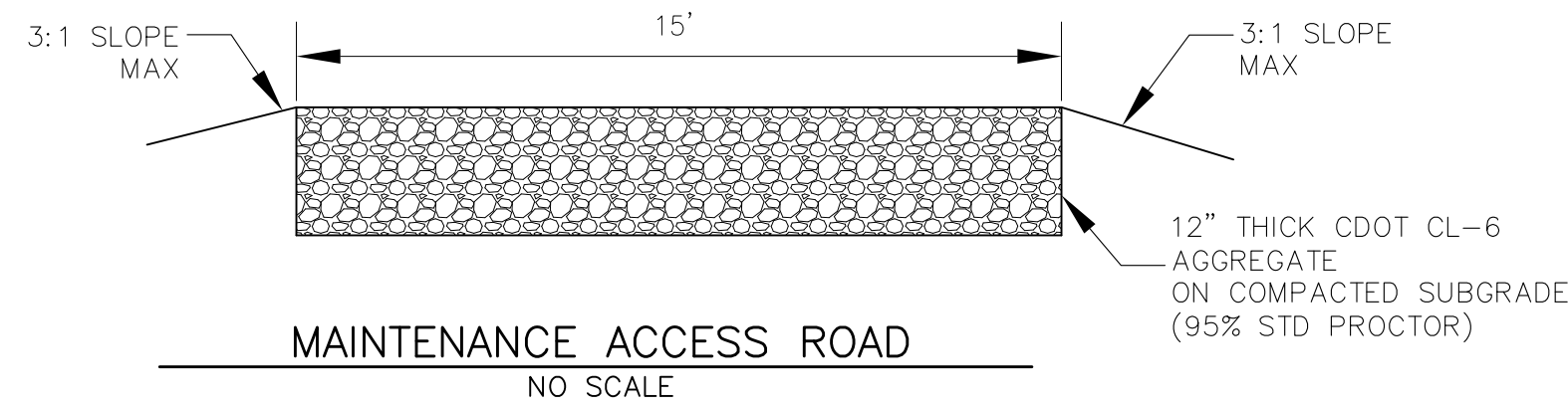


**CORE  
ENGINEERING GROUP**

15004 1ST AVENUE S.  
BURNSVILLE, MN 55306  
PH: 719.570.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@ceg1.com

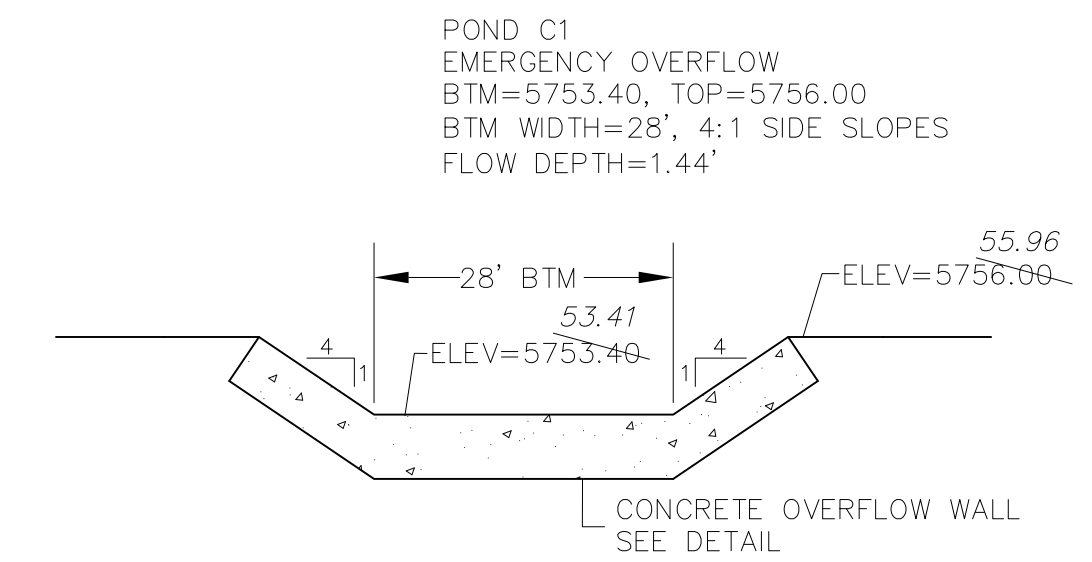
**HILLSIDE AT LORSON RANCH  
WATER QUALITY & POND TRIBUTARY AREAS**

SCALE: NTS	DATE: APRIL, 2022	FIGURE NO. 1
---------------	----------------------	-----------------

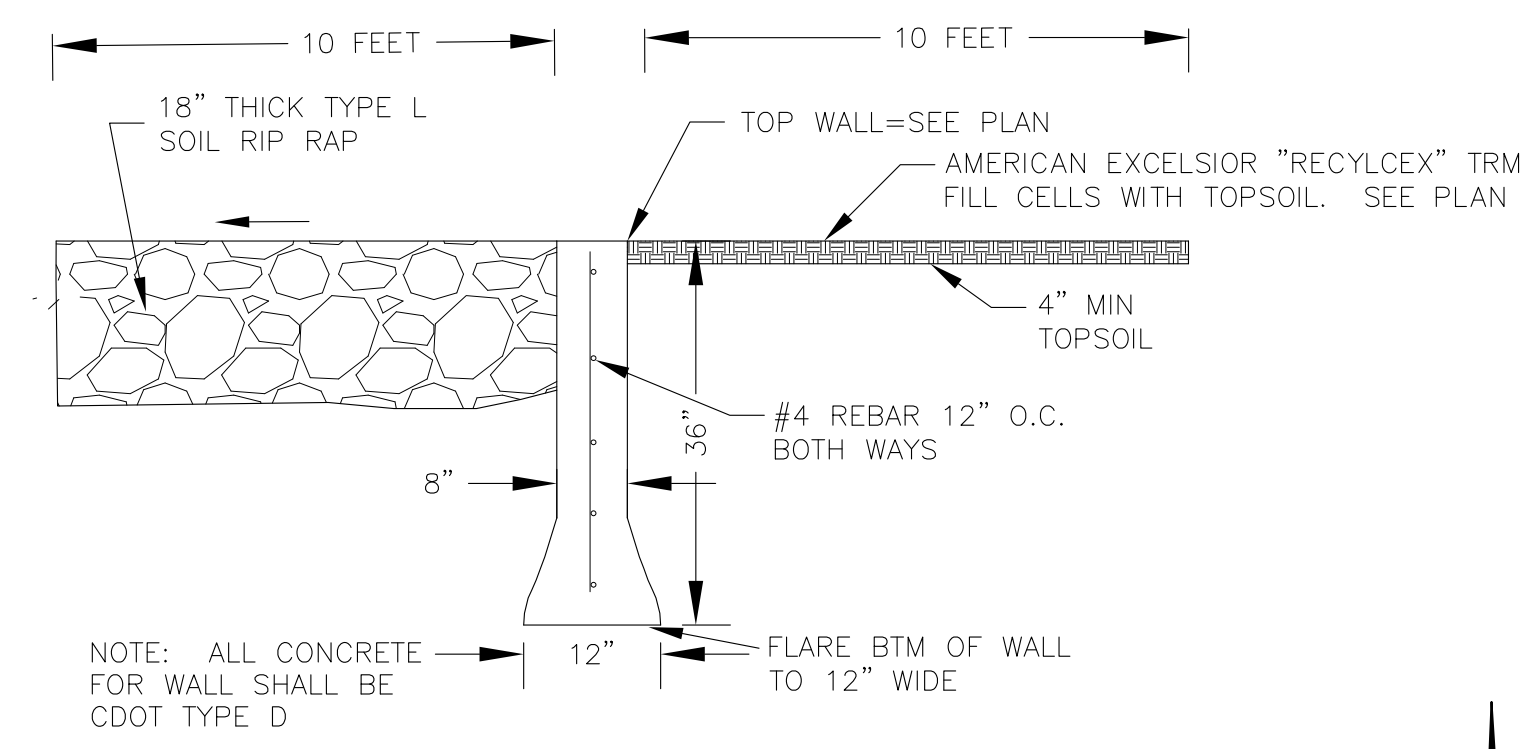


CONCRETE LOW FLOW CHANNEL DETAIL  
NO SCALE

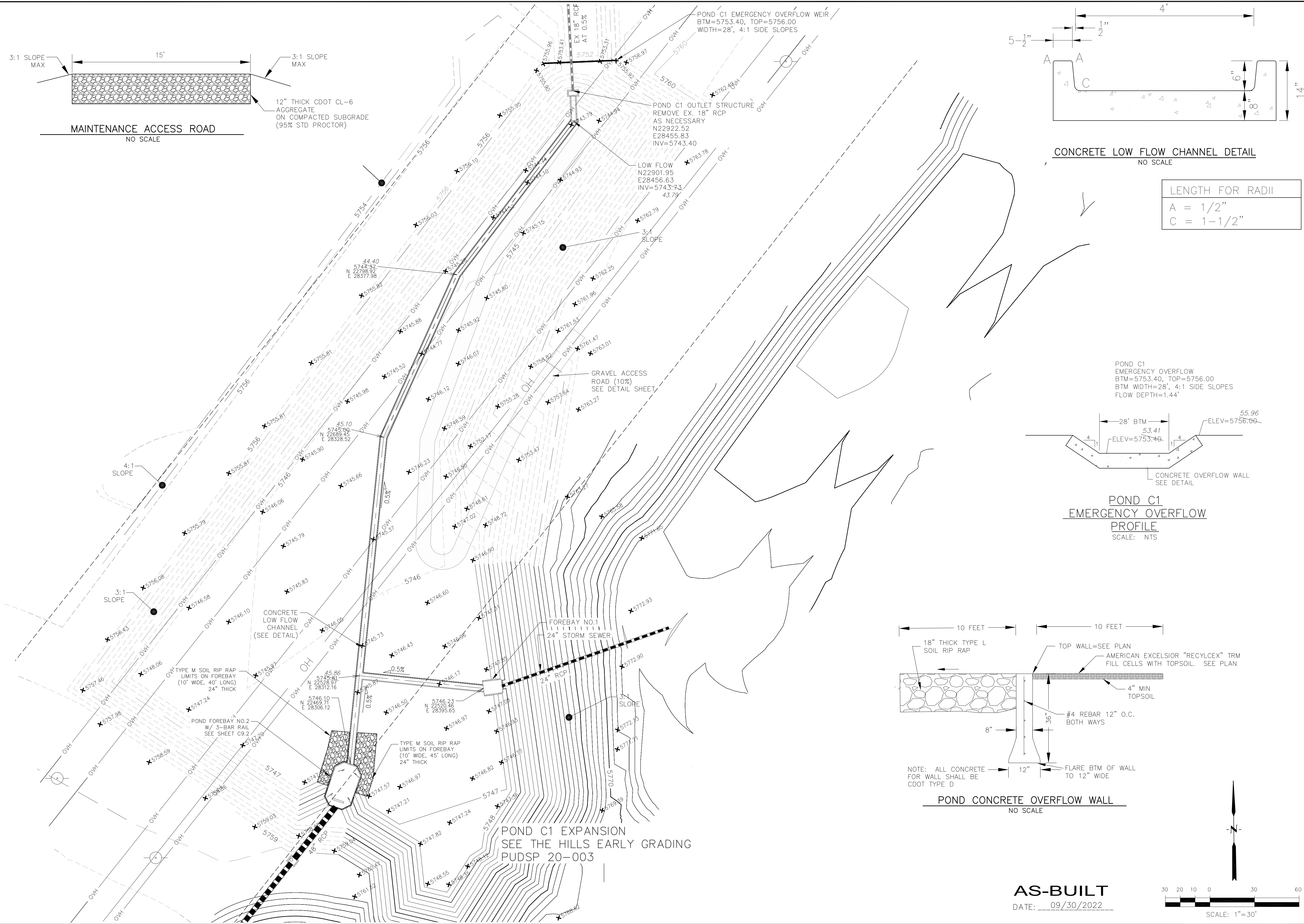
LENGTH FOR RADII  
A = 1/2"  
C = 1-1/2"



POND C1 EMERGENCY OVERFLOW PROFILE  
SCALE: NTS



POND CONCRETE OVERFLOW WALL  
NO SCALE



**CORE ENGINEERING GROUP**  
19004 1ST AVE. SUITE 300  
DENVER, CO 80202  
PHONE: 719.570.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@cegi.com

DATE: \_\_\_\_\_  
DESCRIPTION: \_\_\_\_\_  
NO: \_\_\_\_\_

PREPARED FOR:  
**LORSON, LLC**  
212 N. WAHSATCH AVE, SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
CONTACT: JEFF MARK

PROJECT:  
**THE HILLS COLLECTOR STREET CONSTRUCTION**  
FONTAINE BLVD. - GRAYLING DR  
LORSON BLVD - WALLEYE DR - LAMPREY DR  
COLORADO SPRINGS, COLORADO

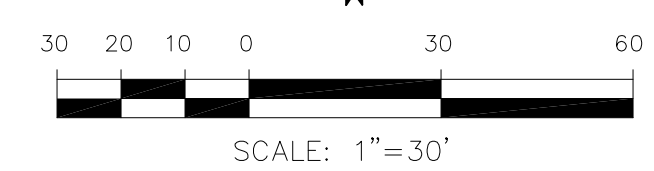
DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

**POND C1 FOREBAY, LOW FLOW CHANNEL AND OUTLET STRUCTURE LAYOUT**



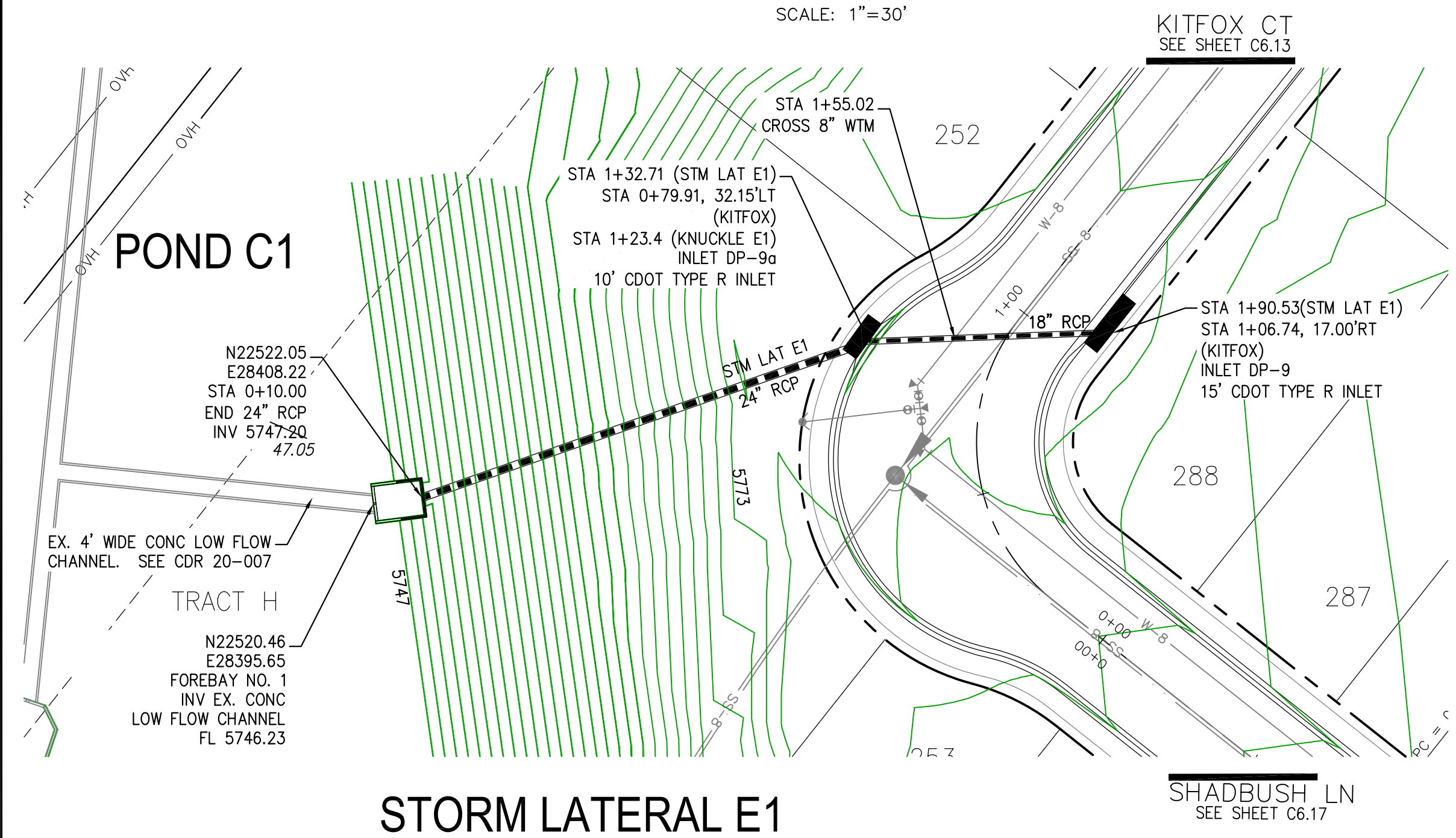
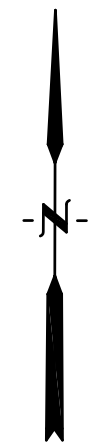
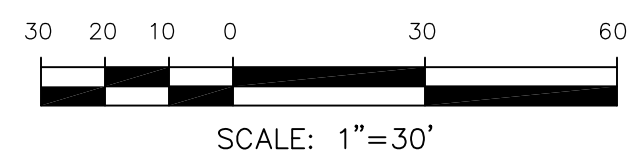
DATE: NOV 12, 2020  
PROJECT NO: 100.061  
SHEET NUMBER: C9.1  
TOTAL SHEETS: 58

**AS-BUILT**  
DATE: 09/30/2022

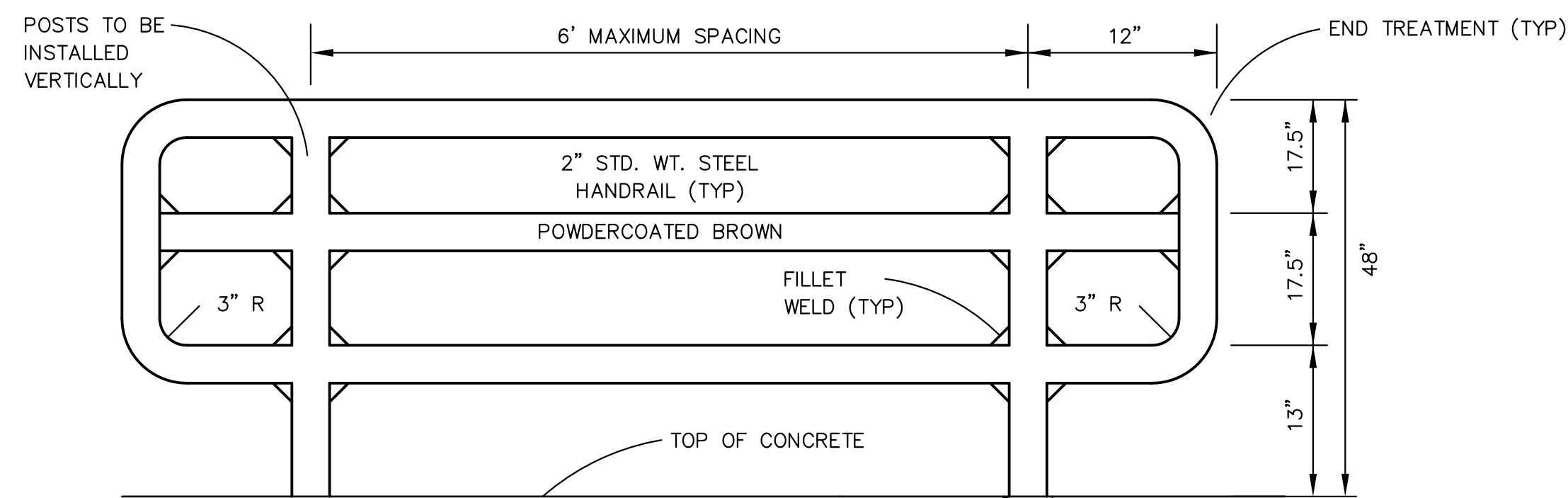


- NOTES**
1. ALL SPOT ELEVATIONS ARE FLOW LINE UNLESS OTHERWISE NOTED.
  2. SEE GRADING PLAN FOR GRADING INFORMATION.
  3. ALL STORM SEWER SHALL BE CLASS III RCP.
  4. ALL MHS SHALL BE TYPE 1 UNLESS OTHERWISE NOTED.

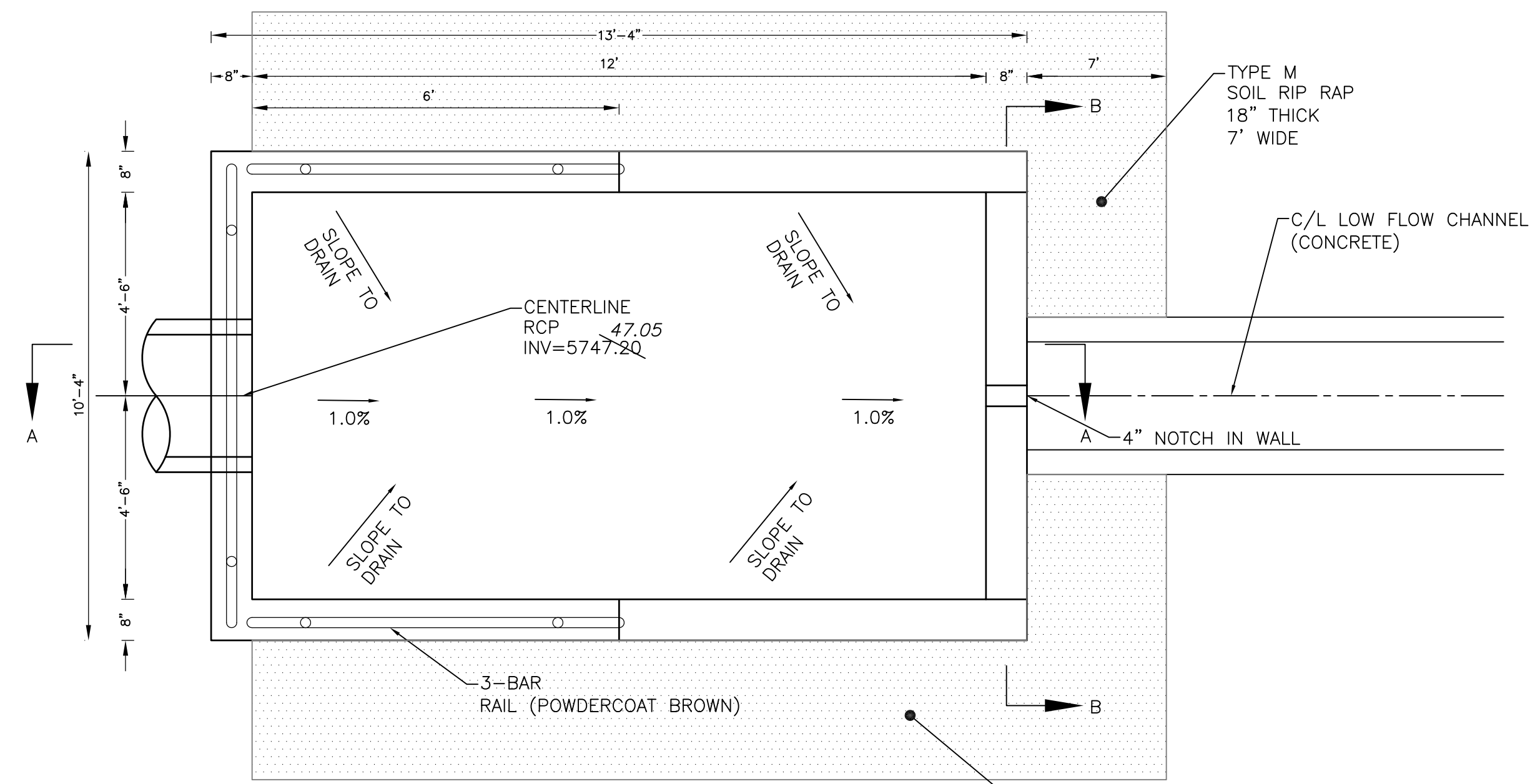
- ① CURVE DATA ID
- ② CURB TRANSITIONS
- ③ PEDESTRIAN RAMP, SEE SHEET C10.1



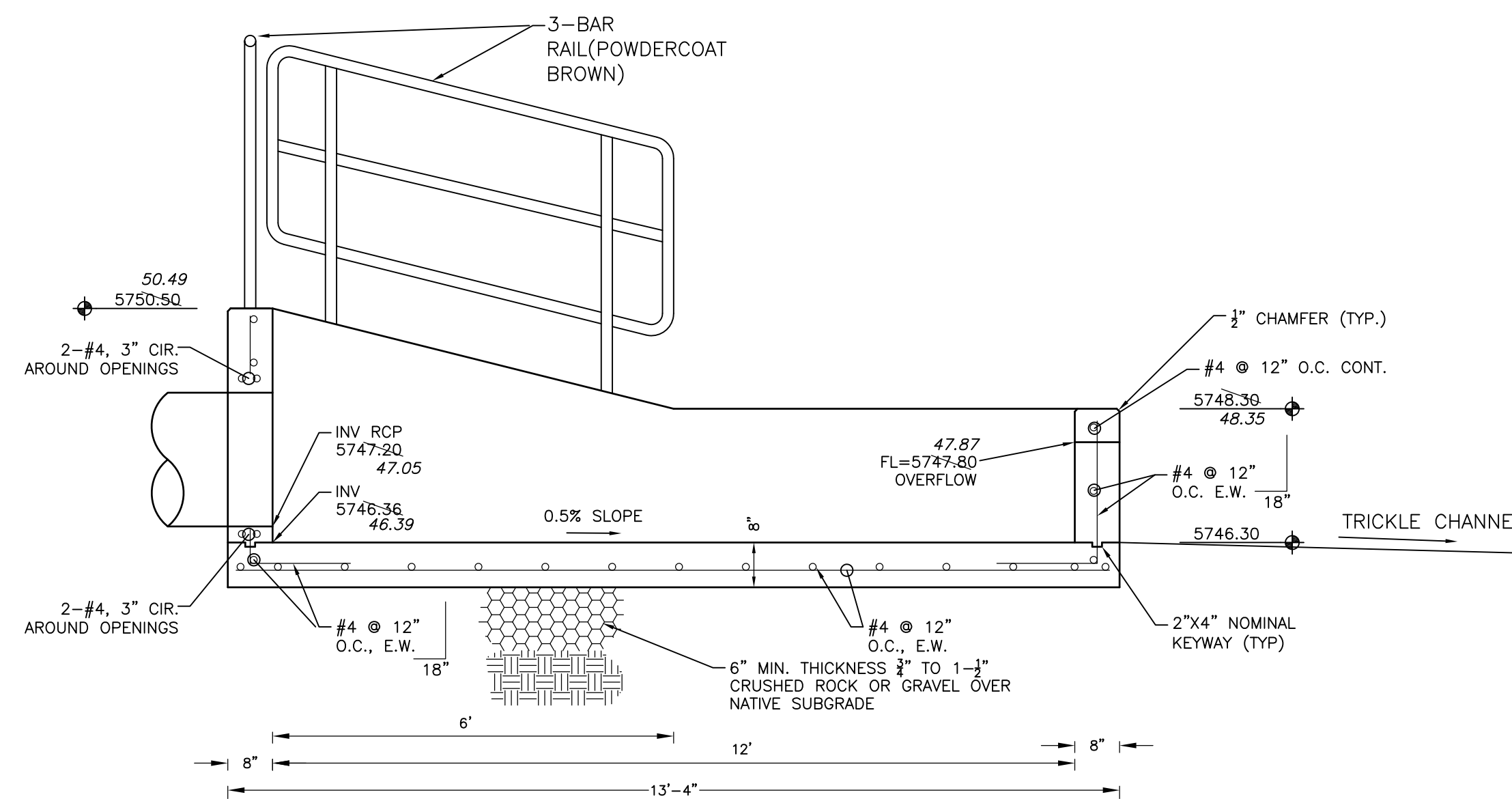
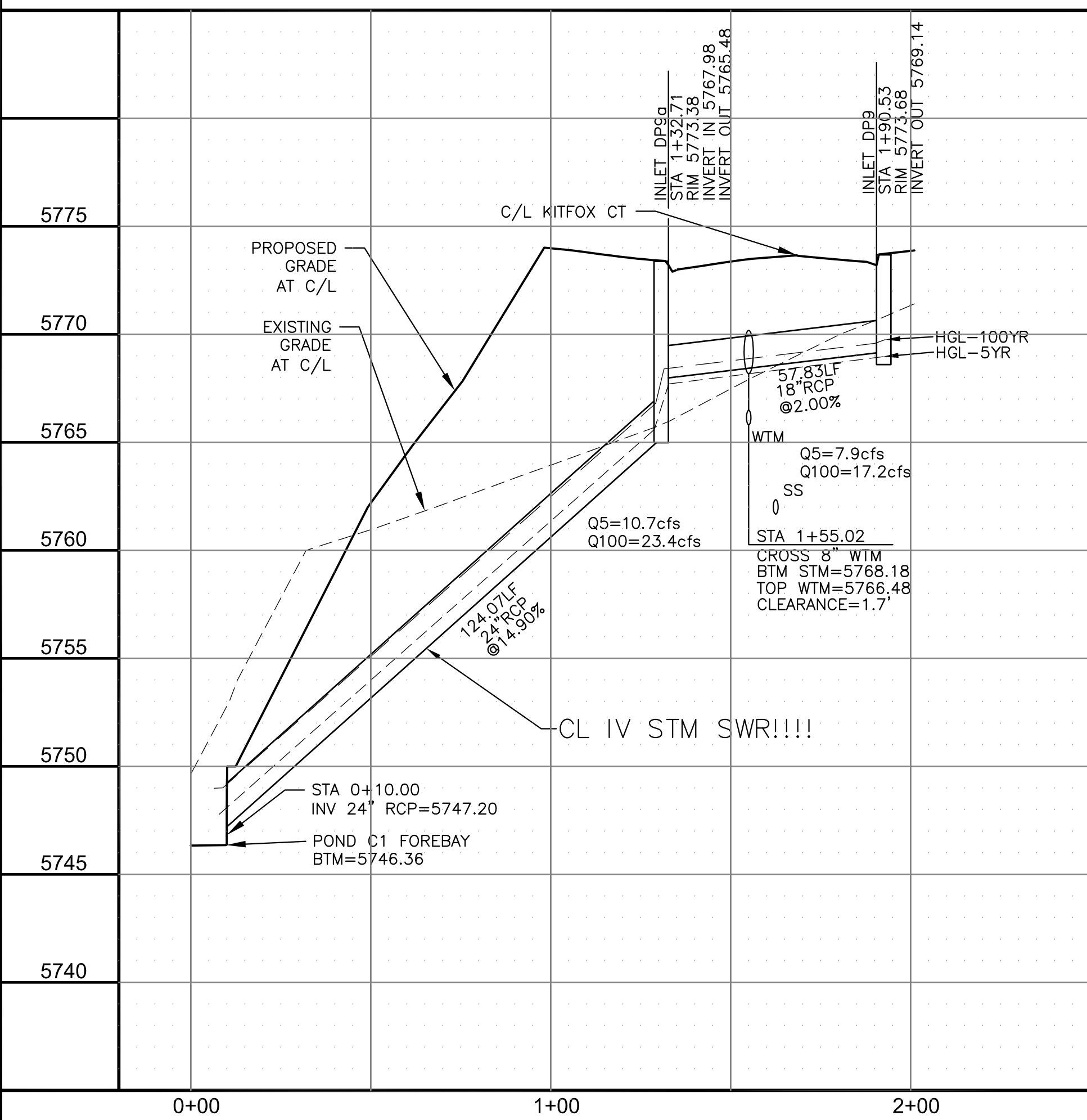
**STORM LATERAL E1**



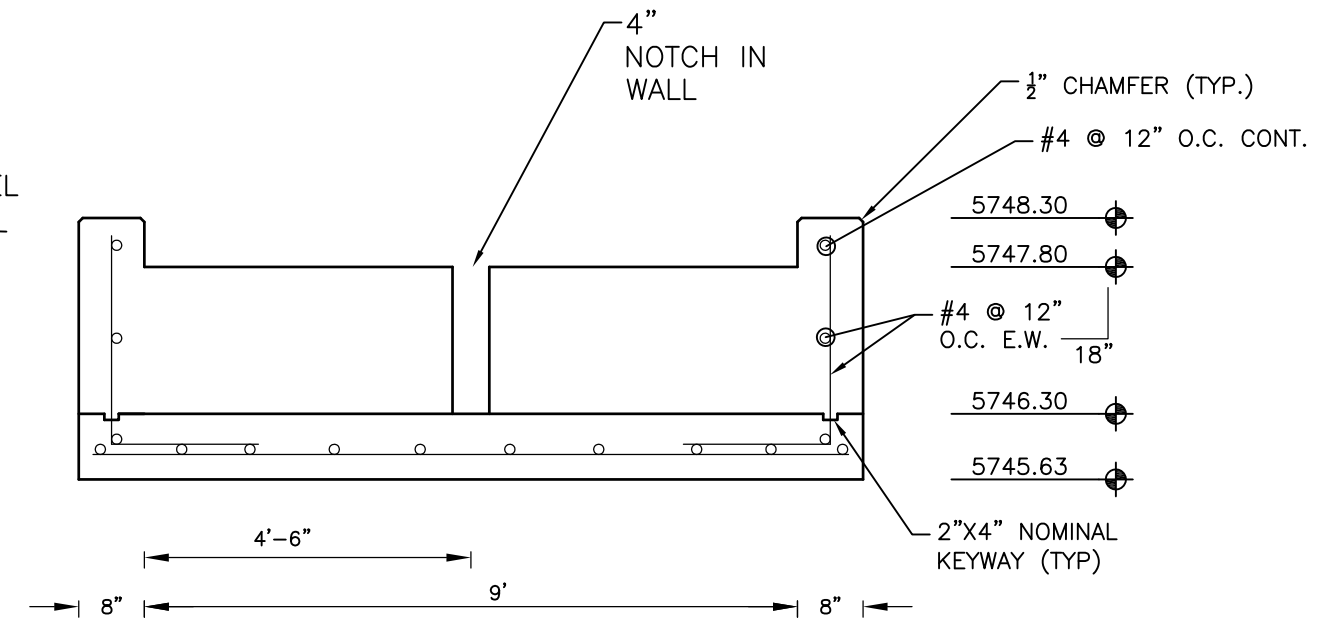
**3-BAR RAIL DETAIL**  
NO SCALE



**FOREBAY NO. 1 DETAIL**  
NO SCALE

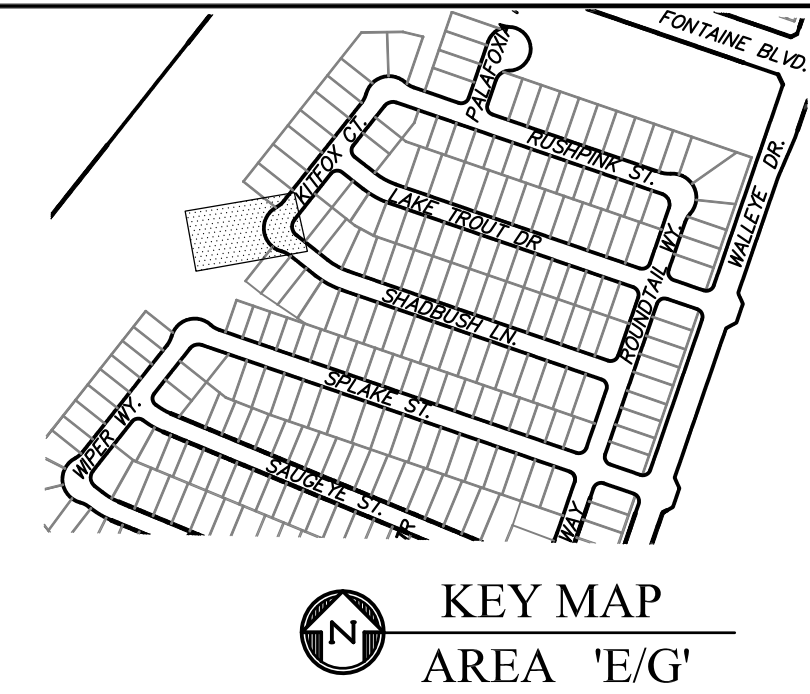


**FOREBAY NO. 1 SECTION A-A**  
NO SCALE



**FOREBAY NO. 1 SECTION B-B**  
NO SCALE

**AS-BUILT**  
DATE: 09/30/2022



**CORE ENGINEERING GROUP**  
15004 1ST AVENUE S.  
BURNING WOOD, CO 80903  
PHONE: 719.570.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@ceg1.com

DATE: JAN 14, 2021  
DESCRIPTION: RAISE SITE BY 1' EAST OF POWERLINES  
NO. 1  
PROJECT: THE HILLS AT LORSON RANCH FILING NO. 1  
212 N. WAHSATCH AVE., SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
CONTACT: JEFF MARK

PREPARED FOR: LORSON, LLC  
212 N. WAHSATCH AVE., SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
CONTACT: JEFF MARK

DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

**STORM SEWER LATERAL - AREA 'E/G'**  
**STORM LATERAL E1**  
**STA 0+00 TO 1+90**

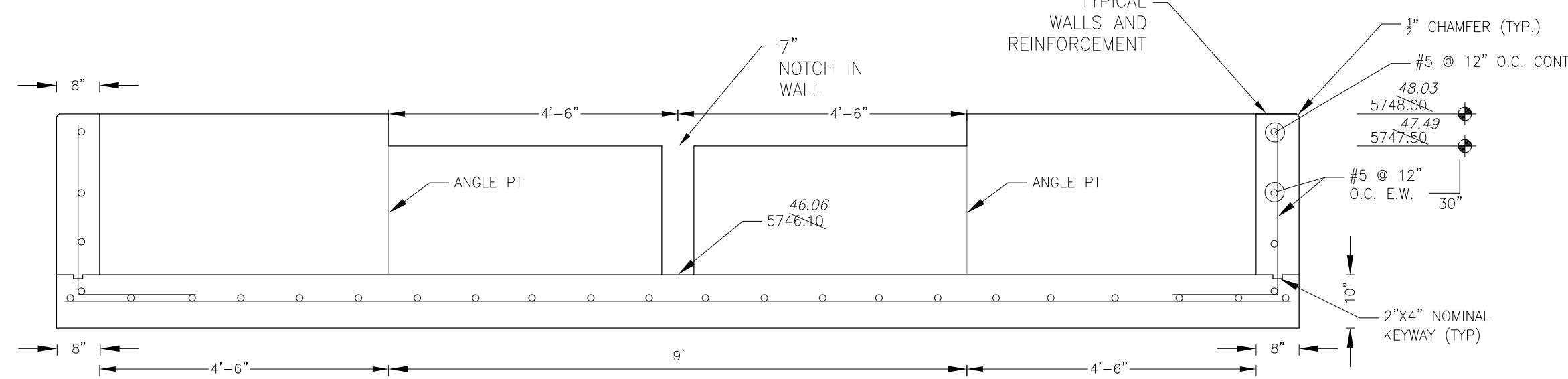
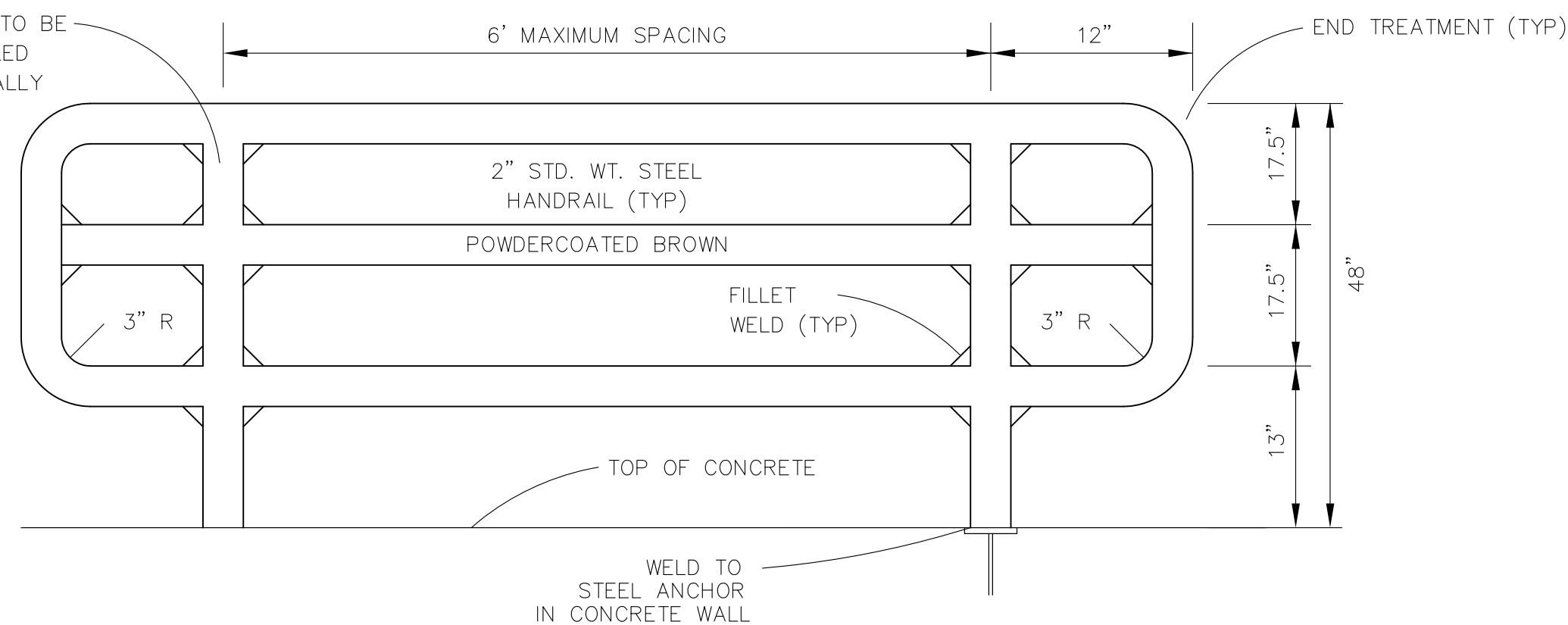
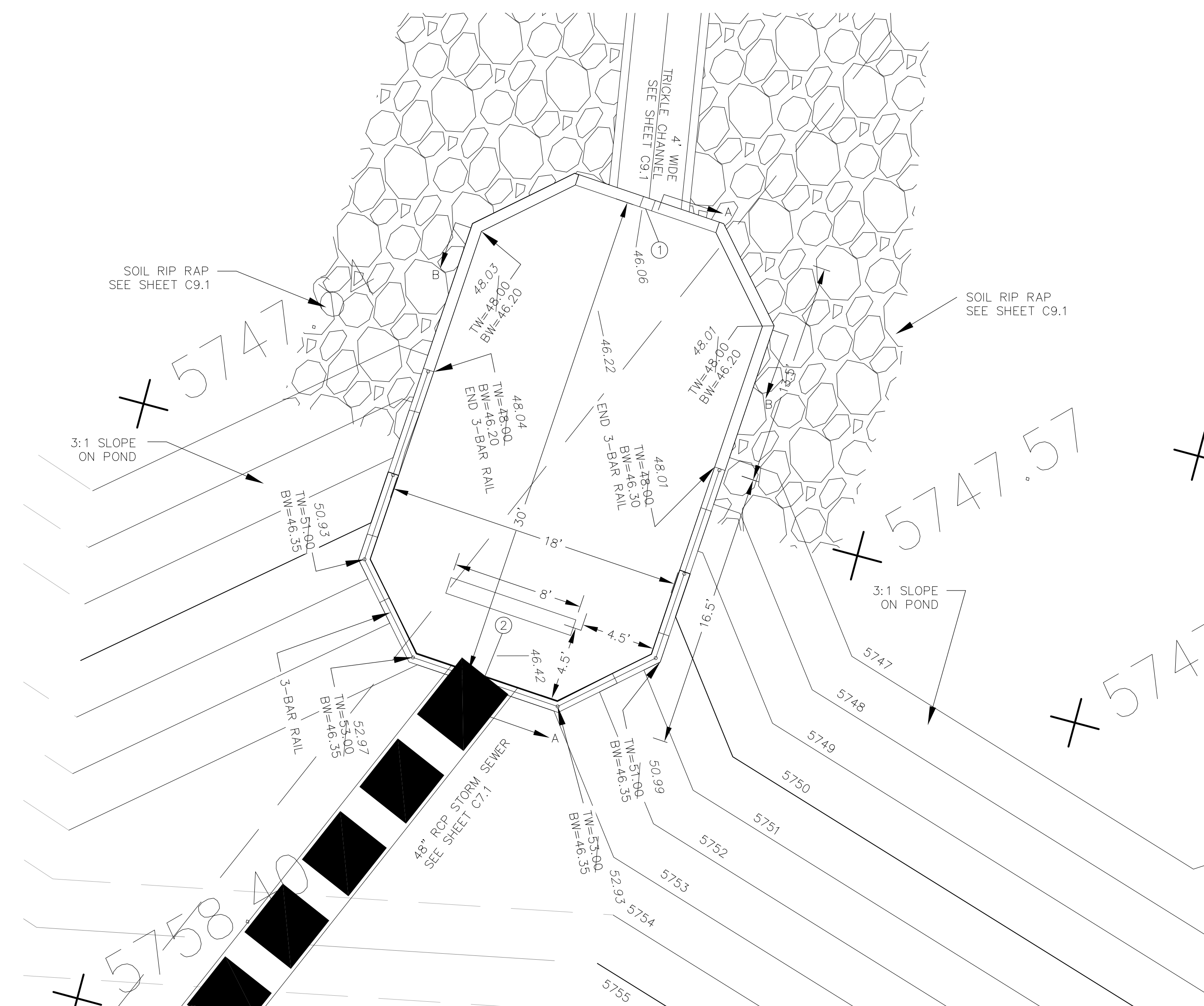
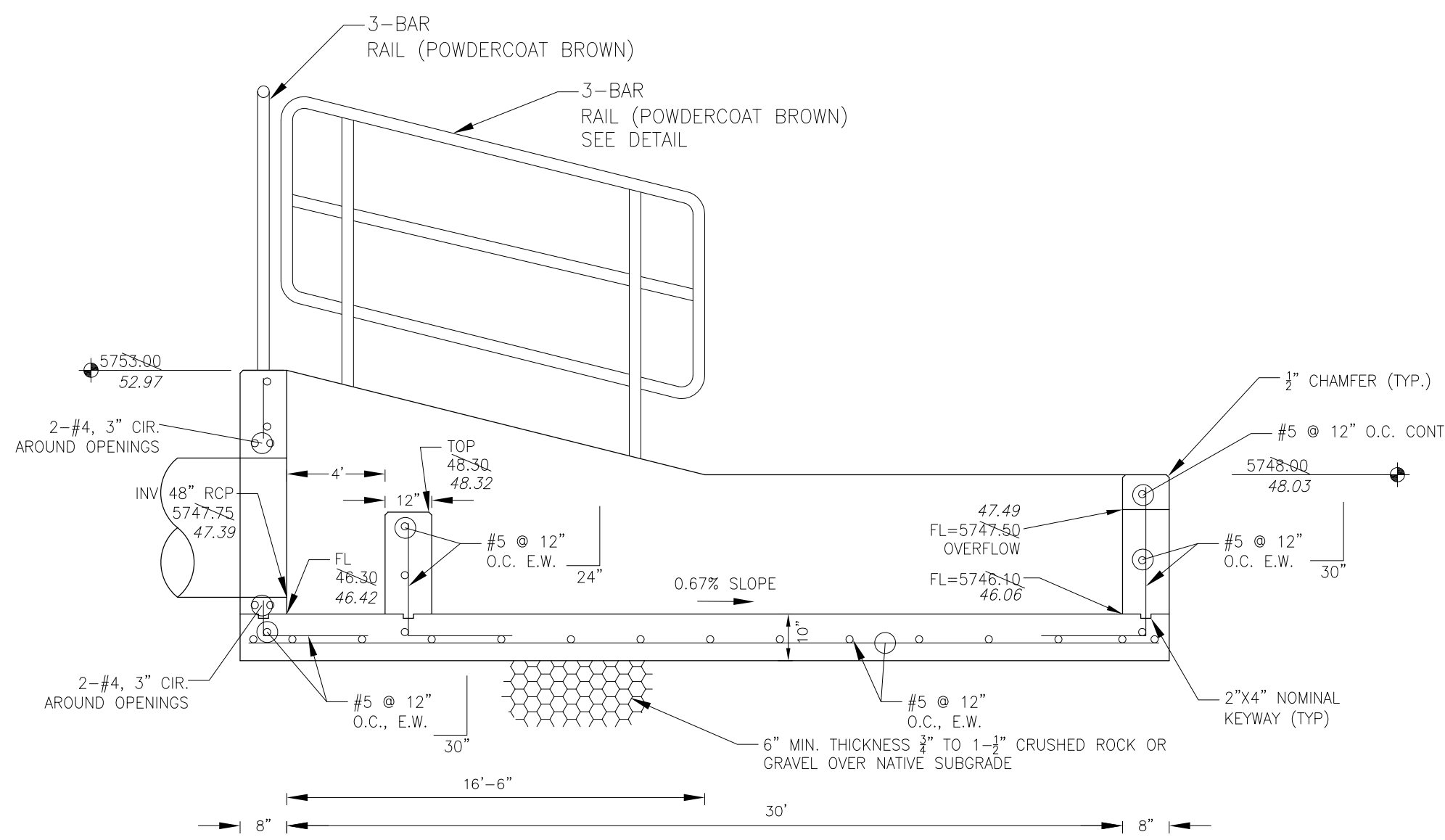


DATE: JUNE 7, 2021

PROJECT NO. 100.062

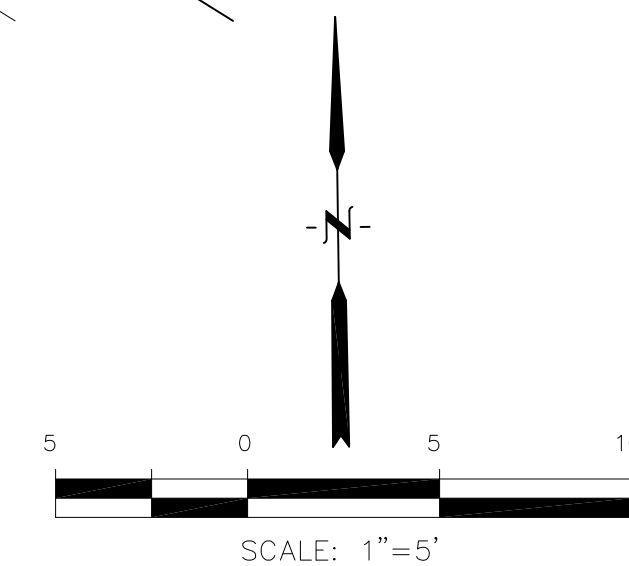
SHEET NUMBER C7.1

TOTAL SHEETS: 42



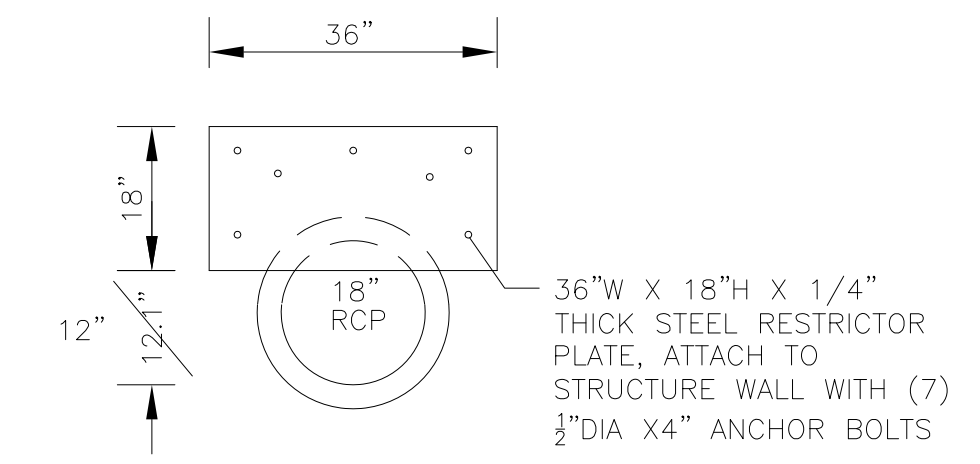
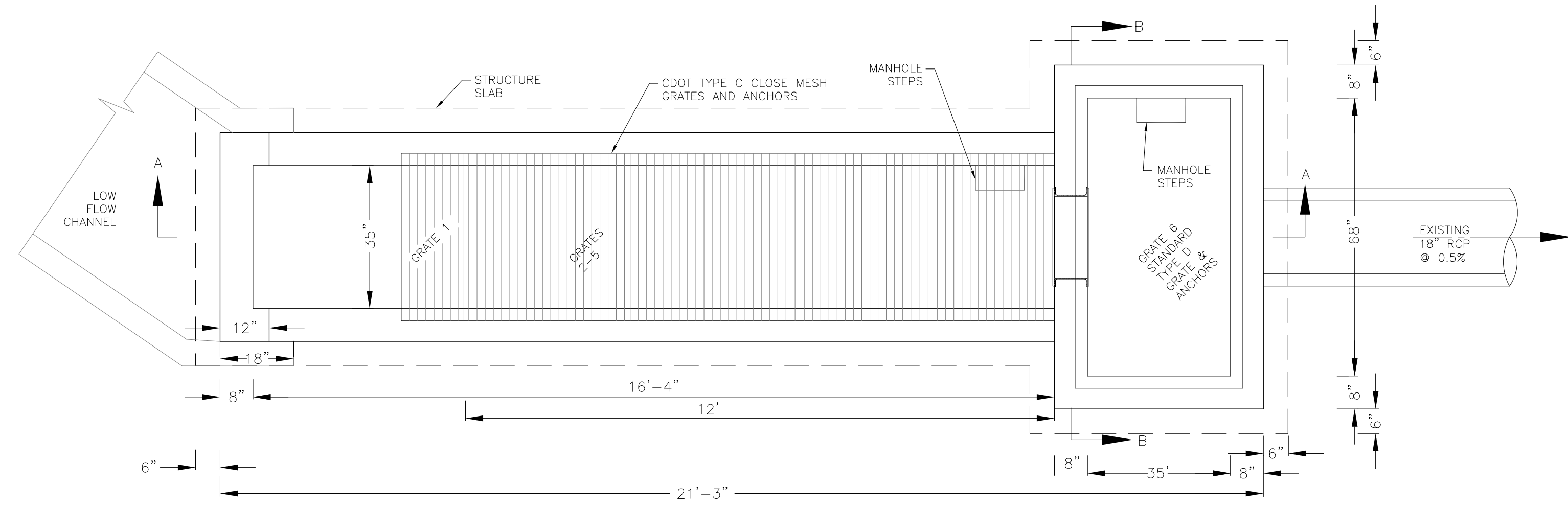
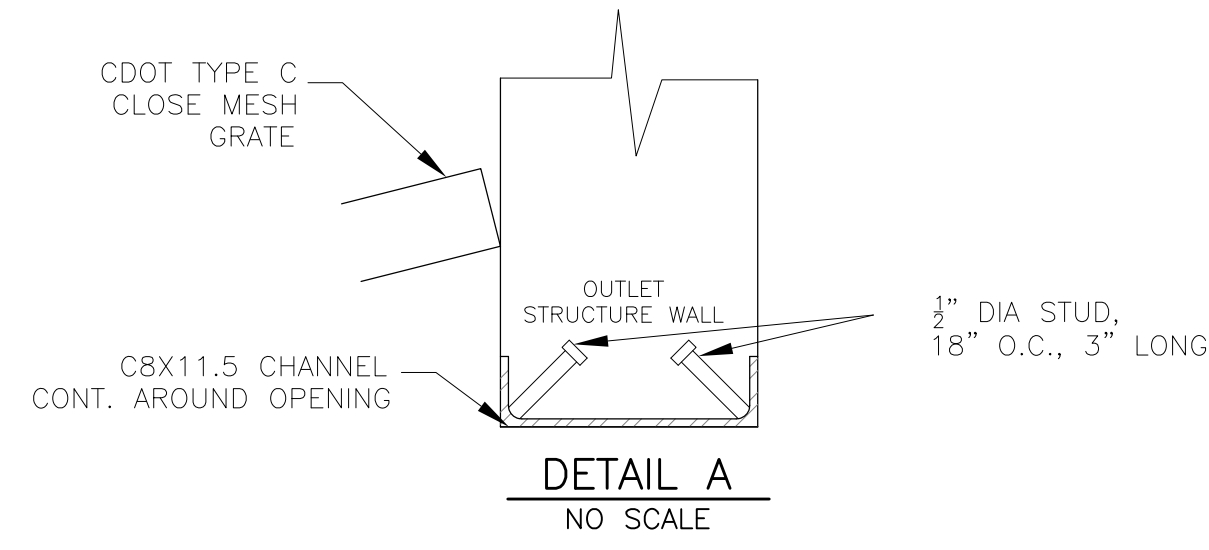
NOTE: ALL CONCRETE FOR FOREBAY SHALL BE CDOT TYPE D

POINT TABLE (FOREBAY)				
NUMBER	NORTHING	EASTING	ELEVATION	NOTES
1	22469.08	28305.90	5746.10	FOREBAY BOTTOM
2	22440.71	28296.15	5746.30	FOREBAY BOTTOM, INV 48"=5747.75

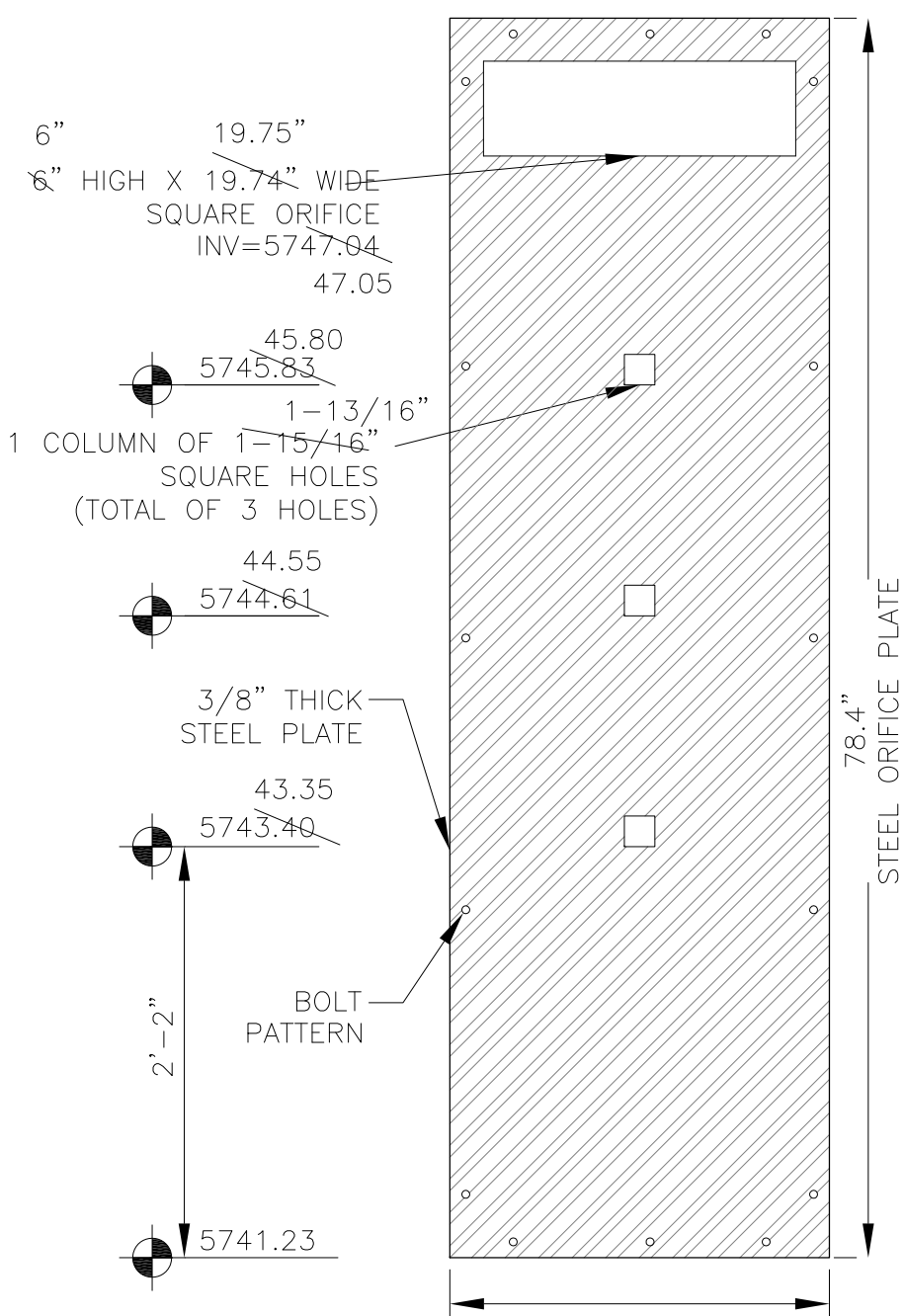
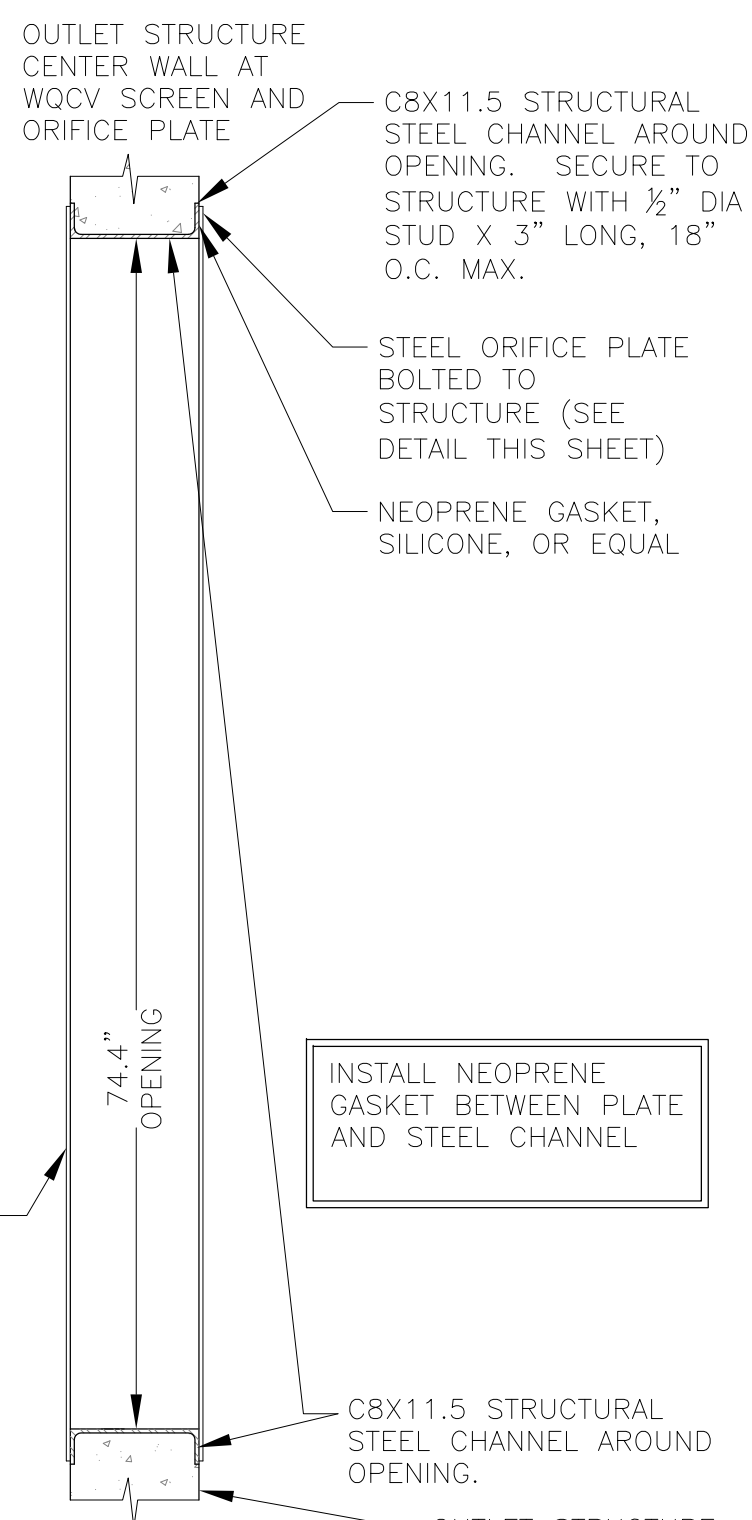
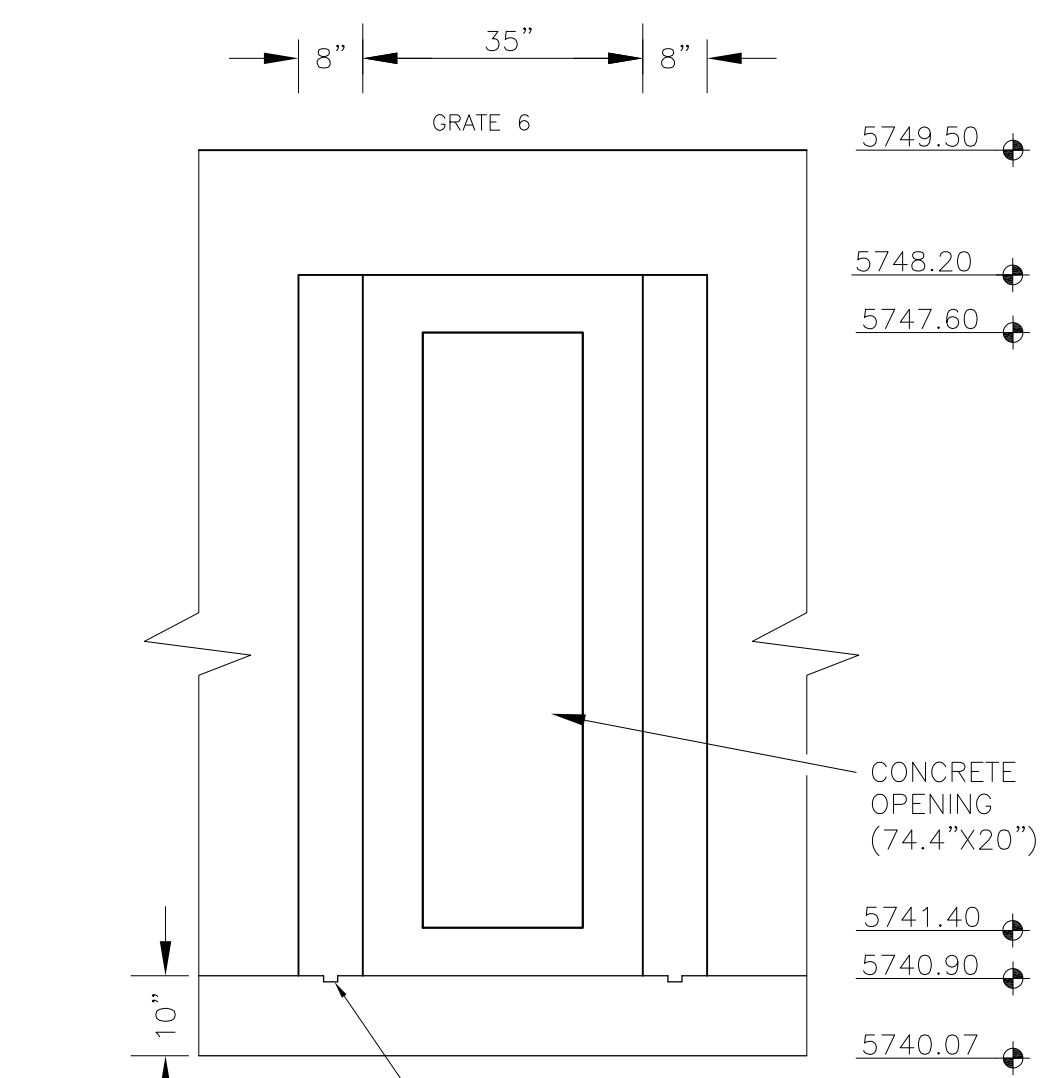
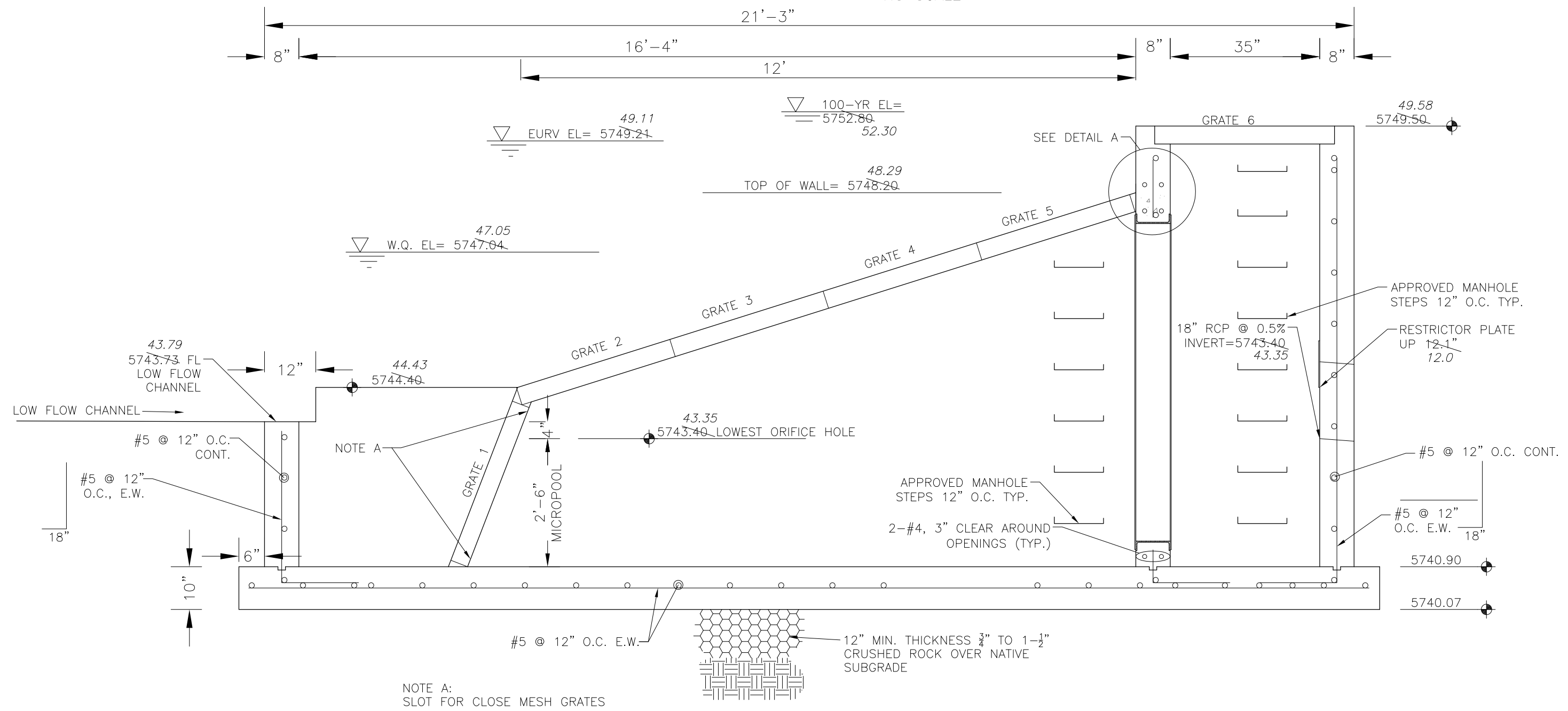
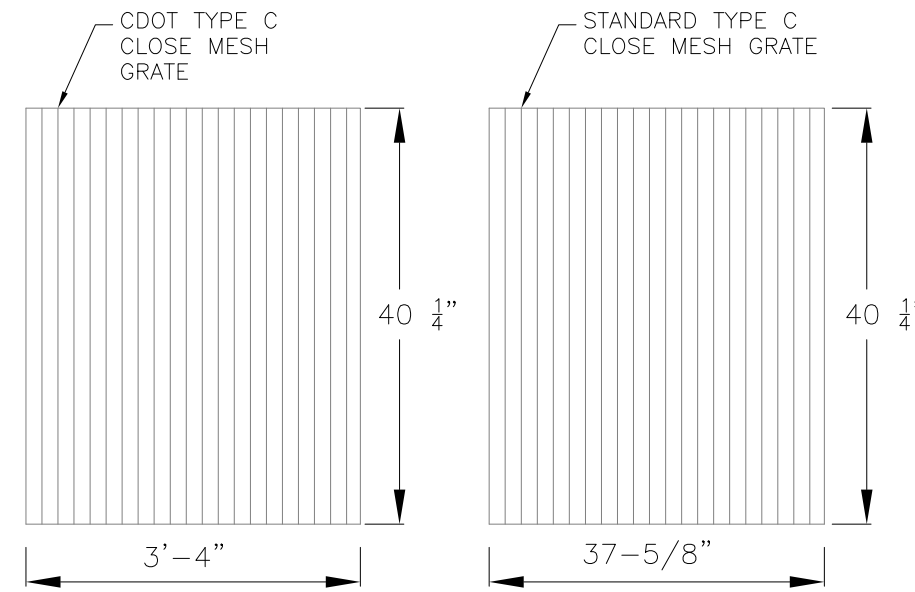


**AS-BUILT**  
 DATE: 09/30/2022





NOTE:  
AFTER CONCRETE STRUCTURE HAS BEEN POURED  
ALL GRATE DIMENSIONS SHALL BE FIELD VERIFIED  
PRIOR TO GRATE CONSTRUCTION

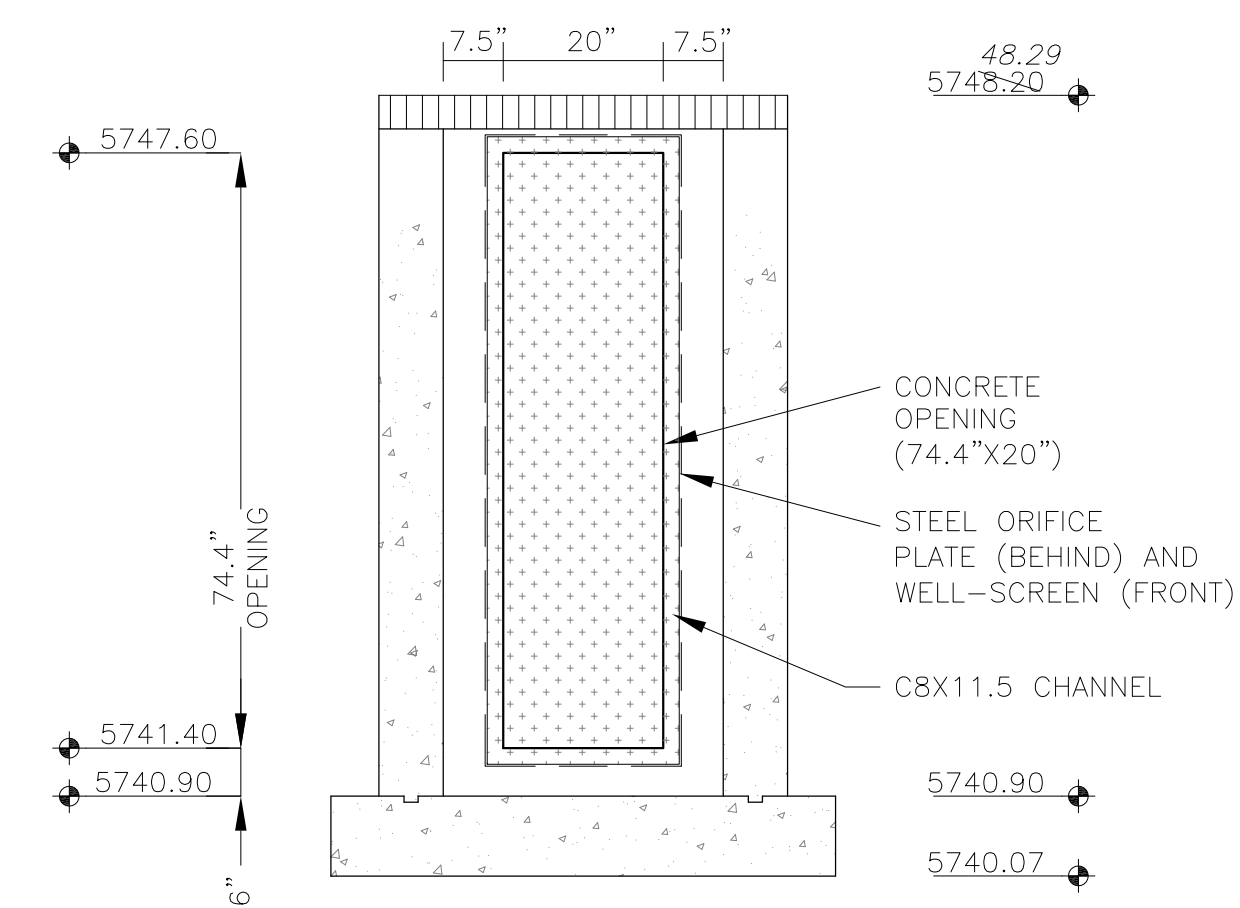


OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:

- PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL COMPONENTS OF THE OUTLET STRUCTURE.
  - GRADE 60 REINFORCING STEEL REQUIRED. SEE TABLE FOR THE MINIMUM LAP SPLICE LENGTH FOR REINFORCING BARS. ALL REINFORCING STEEL SHALL HAVE A TWO-INCH MINIMUM CLEARANCE FROM EDGE OF CONCRETE, UNLESS OTHERWISE NOTED.
- | BAR SIZE           | #4    | #5    | #6    |
|--------------------|-------|-------|-------|
| MIN. SPLICE LENGTH | 1'-3" | 1'-7" | 2'-0" |
- CONCRETE FOR THE OUTLET STRUCTURE AND FOREBAY SHALL BE CDOT CLASS D CONCRETE.
  - CONCRETE FOR DRAIN CHANNELS SHALL BE CDOT CLASS B CONCRETE.
  - EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M-213. EXPANSION JOINT MATERIAL SHALL BE 1/2" THICK, SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE AND THE JOINT SHALL BE SEALED, REFER TO DETAILS.
  - ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 3/8" CHAMFER UNLESS OTHERWISE NOTED.
  - SUBGRADE TO BE 12" THICK CLEAN FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM M698 UNDER STRUCTURE.
  - REFER TO POND DETAILS FOR PRESEDIMENTATION/FOREBAY DESIGN.
  - ENGINEER SHALL BE NOTIFIED PRIOR TO BEGINNING CONSTRUCTION OF OUTLET STRUCTURE TO SCHEDULE OBSERVATION VISITS FOR STRUCTURES.

- WQCV WELL-SCREEN NOTES:
- Well-Screen shall be stainless steel and attached by stainless steel bolts along edge of the mounting frame.
  - WQCV Well Screen
    - Type of Screen: Stainless steel #93 Vee Wire (Johnson Vee Wire (tm) Stainless Steel Screen or equivalent with 60% open area)
    - Screen slot opening dimension: 0.139" (Screen #93 Vee Wire Slot Opening)
    - Type and Size of Support Rod: TE 0.074"X0.50"
    - Spacing of Support Rod (O.C.): 1.0 Inch
    - Total Screen Thickness: 0.655"
    - Carbon Steel Holding Frame Type: 3/4" x 1.0" angle

**AS-BUILT**  
DATE: 09/30/2022



**CORE ENGINEERING GROUP**  
15004 1ST AVENUE S.  
PH: 719.570.5506  
PH: 719.570.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@cgei.com

DATE: \_\_\_\_\_  
DESCRIPTION: \_\_\_\_\_  
NO: \_\_\_\_\_  
DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

PREPARED FOR:  
**LORSON, LLC**  
212 N. WAHSATCH AVE. SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
CONTACT: JEFF MARK

PROJECT:  
**THE HILLS COLLECTOR STREET CONSTRUCTION**  
FONTAINE BLVD. - GRAYLING DR  
LORSON BLVD - WALLEYE DR - LAMPREY DR  
COLORADO SPRINGS, COLORADO

**POND C1**  
**FULL SPECTRUM**  
**OUTLET STRUCTURE DETAILS**

DATE:  
NOV 12, 2020

PROJECT NO.  
100.061

SHEET NUMBER  
**C9.12**

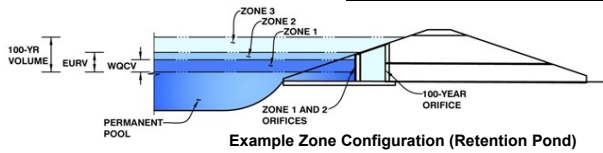
TOTAL SHEETS: 58

PROFESSIONAL ENGINEER  
RICHARD L. SCHINDLER  
NOV 12 2020  
33997

# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

**Project: The Hills at Lorson Ranch**  
**Basin ID: Pond C2.1-asbuilt**



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.32	1.368	Orifice Plate
Zone 2 (EURV)	6.18	3.045	Rectangular Orifice
Z3 (100+1/2WQCV)	8.98	3.745	Weir&Pipe (Restrict)
<b>Total (all zones)</b>		<b>8.159</b>	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =  ft (distance below the filtration media surface)  
 Underdrain Orifice Diameter =  inches

Calculated Parameters for Underdrain  
 Underdrain Orifice Area =  ft<sup>2</sup>  
 Underdrain Orifice Centroid =  feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =  ft (relative to basin bottom at Stage = 0 ft)  
 Depth at top of Zone using Orifice Plate =  ft (relative to basin bottom at Stage = 0 ft)  
 Orifice Plate: Orifice Vertical Spacing =  inches  
 Orifice Plate: Orifice Area per Row =  sq. inches (use rectangular openings)

Calculated Parameters for Plate  
 WQ Orifice Area per Row =  ft<sup>2</sup>  
 Elliptical Half-Width =  feet  
 Elliptical Slot Centroid =  feet  
 Elliptical Slot Area =  ft<sup>2</sup>

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.95	2.05					
Orifice Area (sq. inches)	4.00	4.00	4.00					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	<input type="text" value="3.20"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	<input type="text" value="6.18"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	<input type="text" value="6.00"/>	<input type="text" value="N/A"/>	inches
Vertical Orifice Width =	<input type="text" value="14.59"/>	<input type="text" value="N/A"/>	inches

Calculated Parameters for Vertical Orif  
 Zone 2 Rectangular =  ft<sup>2</sup>  
 Vertical Orifice Centroid =  feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe).

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	<input type="text" value="6.11"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	<input type="text" value="8.00"/>	<input type="text" value="N/A"/>	feet
Overflow Weir Gate Slope =	<input type="text" value="0.00"/>	<input type="text" value="N/A"/>	H:V
Horiz. Length of Weir Sides =	<input type="text" value="6.00"/>	<input type="text" value="N/A"/>	feet
Overflow Gate Open Area % =	<input type="text" value="70%"/>	<input type="text" value="N/A"/>	% , gate open area/total area
Debris Clogging % =	<input type="text" value="50%"/>	<input type="text" value="N/A"/>	%

Calculated Parameters for Overflow We  
 Zone 3 Weir =  ft<sup>2</sup>  
 Overflow Weir Slope Length =  feet  
 Gate Open Area / 100-yr Orifice Area =  N/A  
 Overflow Gate Open Area w/o Debris =  N/A  
 Overflow Gate Open Area w/ Debris =  N/A

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	<input type="text" value="0.43"/>	<input type="text" value="N/A"/>	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	<input type="text" value="30.00"/>	<input type="text" value="N/A"/>	inches
Restrictor Plate Height Above Pipe Invert =	<input type="text" value="30.00"/>	<input type="text" value="N/A"/>	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pl  
 Outlet Orifice Area =  ft<sup>2</sup>  
 Outlet Orifice Centroid =  feet  
 Half-Central Angle of Restrictor Plate on Pipe =  N/A

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	<input type="text" value="9.18"/>	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	<input type="text" value="25.00"/>	feet
Spillway End Slopes =	<input type="text" value="4.00"/>	H:V
Freeboard above Max Water Surface =	<input type="text" value="1.01"/>	feet

Calculated Parameters for Spillway  
 Spillway Design Flow Depth =  feet  
 Stage at Top of Freeboard =  feet  
 Basin Area at Top of Freeboard =  acres  
 Basin Volume at Top of Freeboard =  acre-ft

top micropool = 5761.15 = stage 0

## Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF)

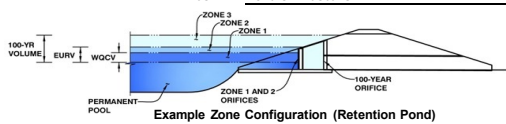
	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =								
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	1.368	4.414	4.152	5.828	7.285	9.182	10.750	12.716
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.152	5.828	7.285	9.182	10.750	12.716
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	7.5	21.2	32.2	57.6	72.4	92.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.10	0.28	0.43	0.77	0.97	1.24
Peak Inflow Q (cfs) =	N/A	N/A	63.8	91.4	112.2	146.0	171.6	201.7
Peak Outflow Q (cfs) =	0.7	6.3	4.9	13.5	32.2	59.3	62.0	66.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	1.0	1.0	0.9	0.7
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Gate 1 (fps) =	N/A	0.03	N/A	0.2	0.8	1.6	1.6	1.7
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	46	46	46	45	42	41	38
Time to Drain 99% of Inflow Volume (hours) =	40	50	51	52	51	50	49	49
Maximum Ponding Depth (ft) =	3.32	6.18	5.40	6.36	6.68	7.12	7.70	8.69
Area at Maximum Ponding Depth (acres) =	0.93	1.20	1.13	1.22	1.25	1.29	1.34	1.44
Maximum Volume Stored (acre-ft) =	1.369	4.424	3.503	4.642	5.025	5.583	6.347	7.726

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)

Project: The Hills at Lorson Ranch

Basin ID: Pond C2.1-asuilt



top micropool-5761.15

Watershed Information

Table with watershed parameters: Selected BMP Type = EDB, Watershed Area = 74.50 acres, Watershed Length = 2,500 ft, etc.

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Table with runoff and detention volumes: Water Quality Capture Volume (WQCV) = 1.368 acre-feet, Excess Urban Runoff Volume (EURV) = 4.414 acre-feet, etc.

Optional User Overrides

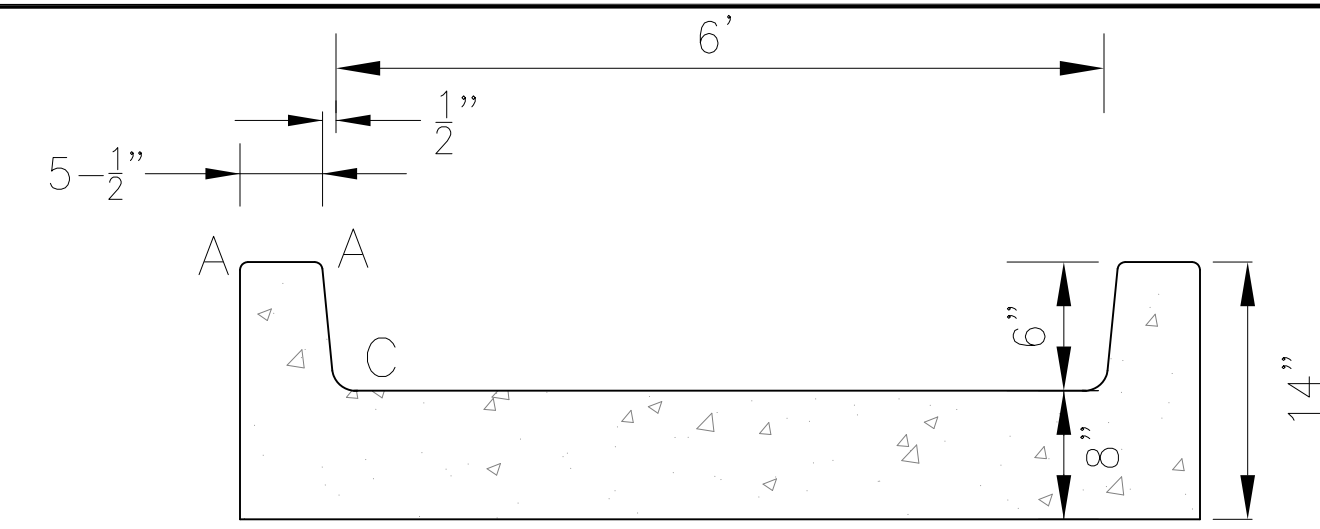
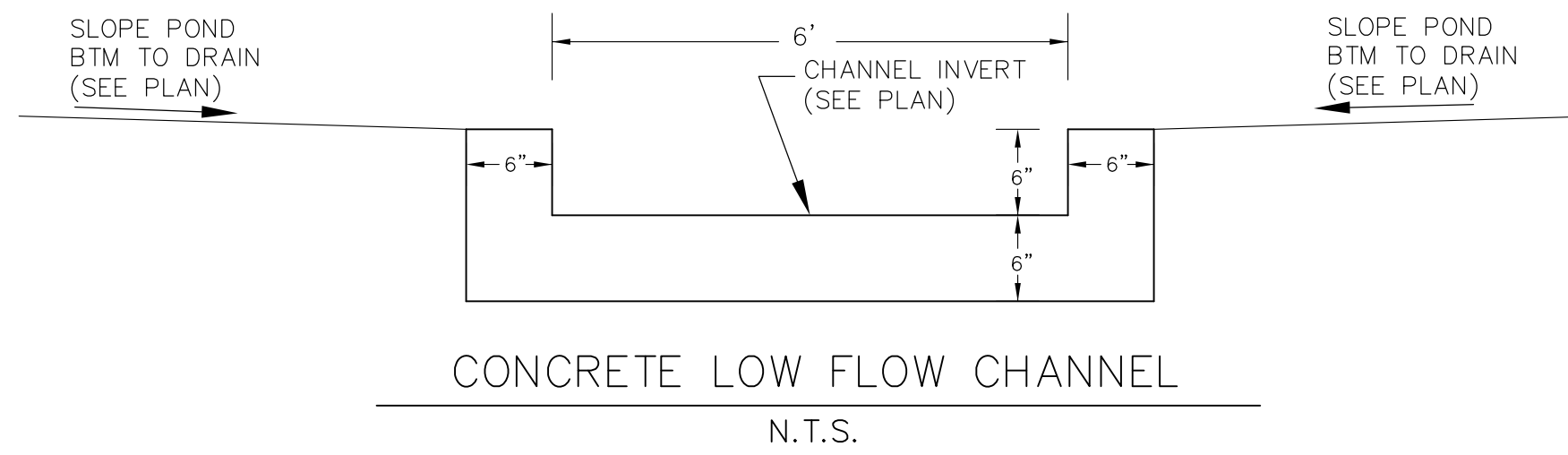
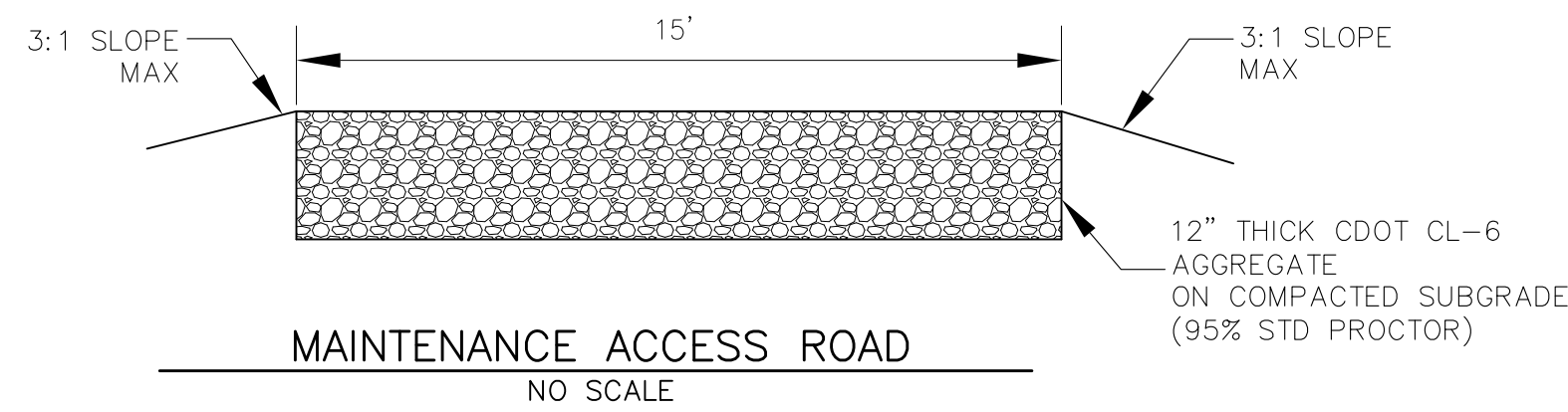
Table with optional user overrides for various parameters like runoff volumes in inches.

Define Zones and Basin Geometry

Table with basin geometry parameters: Zone 1 Volume (WQCV) = 1.368 acre-feet, Zone 2 Volume (EURV - Zone 1) = 3.045 acre-feet, etc.

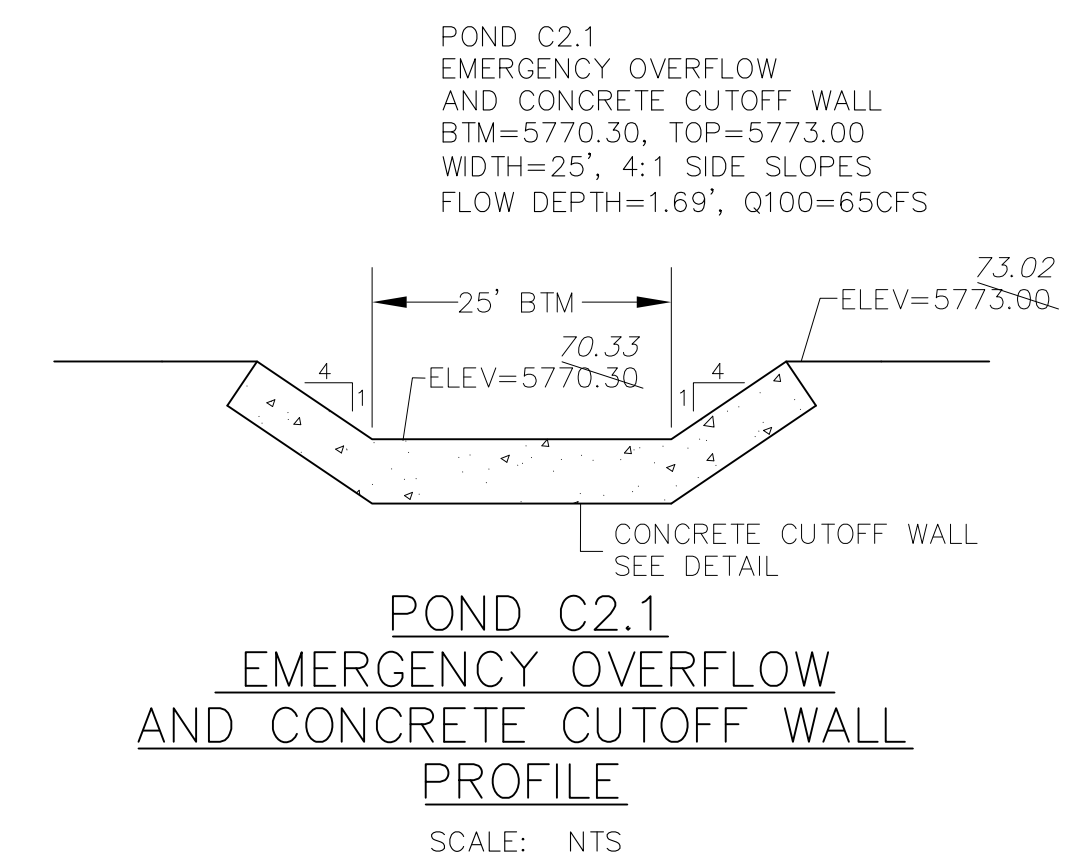
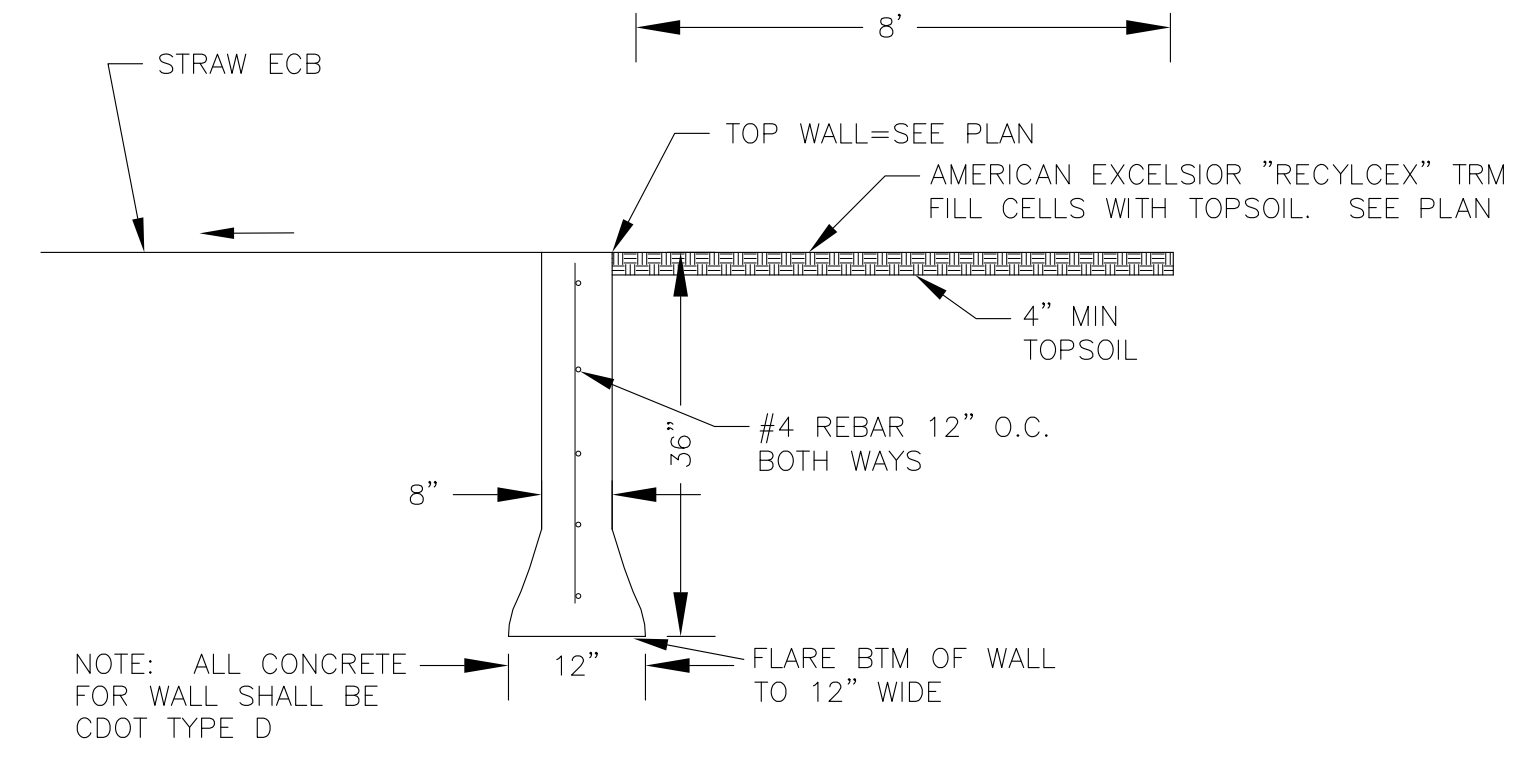
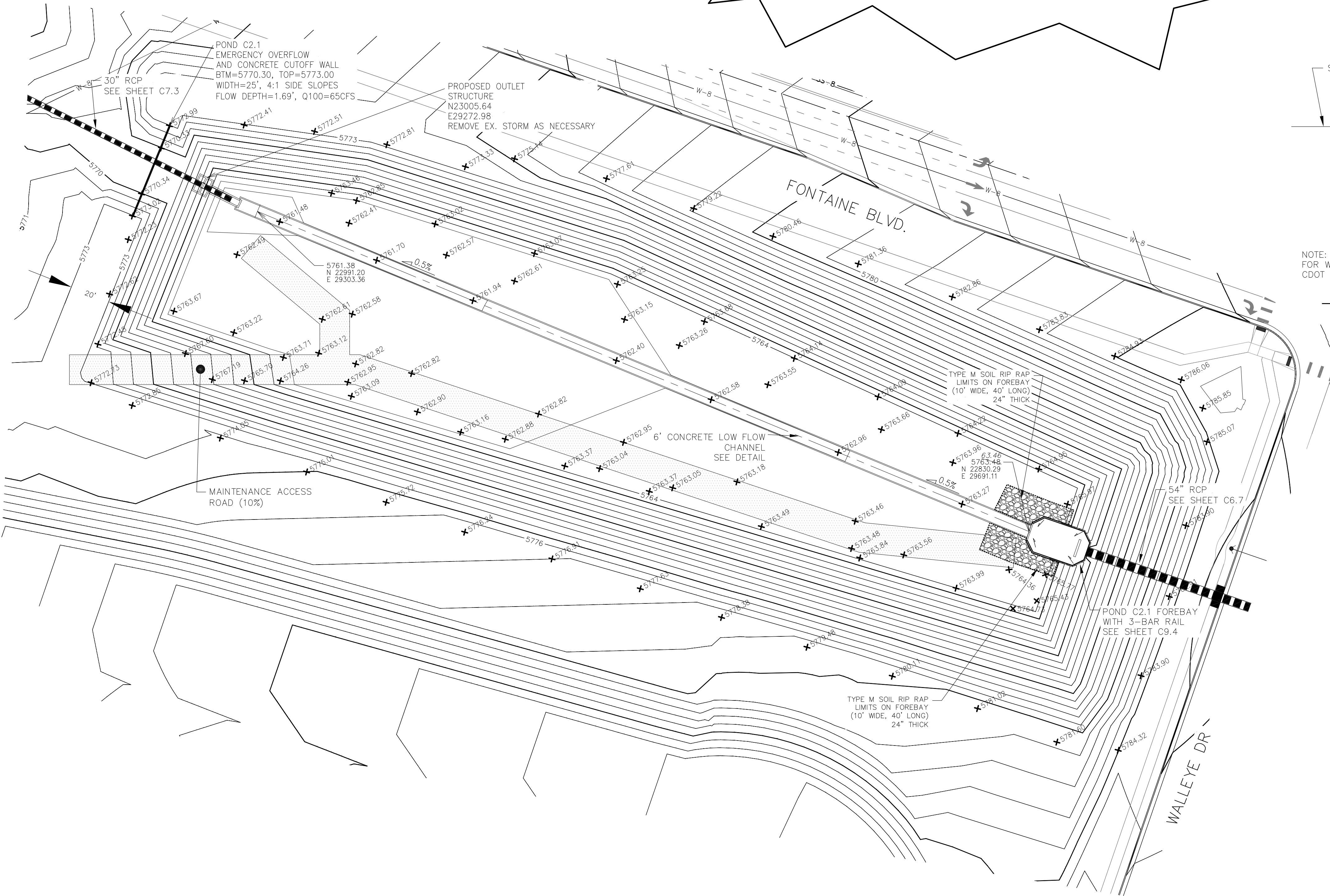
Depth Increment = 0.20 ft

Main stage-storage table with columns: Stage (ft), Optional Override Stage (ft), Length (ft), Width (ft), Area (ft^2), Optional Override Area (ft^2), Area (acre), Volume (ft^3), Volume (ac-ft). Rows include Top of Micropool and stages 5761.33 through 5773.



LENGTH FOR RADII	
A	= 1/2"
C	= 1-1/2"

POND C2.1 IS LOCATED IN TRACT G, THE HILLS AT LORSON RANCH FILING NO. 1. SEE MAINTENANCE AGREEMENT AT REC. NO. 220211669



**CORE ENGINEERING GROUP**  
15004 1ST AVENUE S.  
DENVER, CO 80232  
PHONE: 719.570.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@ceg1.com

DATE: JAN 12, 2021

DESCRIPTION: RAISE SITE 1' EAST OF POWERLINES

NO. 1

PROJECT: THE HILLS COLLECTOR STREET CONSTRUCTION  
212 N. WAHSATCH AVE, SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
LORSON BLVD-WALLEVE DR-LAMPREY DR  
COLORADO SPRINGS, COLORADO  
CONTACT: JEFF MARK

PREPARED FOR: LORSON, LLC  
212 N. WAHSATCH AVE, SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@ceg1.com

DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

**POND C2.1 FOREBAY AND LOW FLOW CHANNEL LAYOUT**



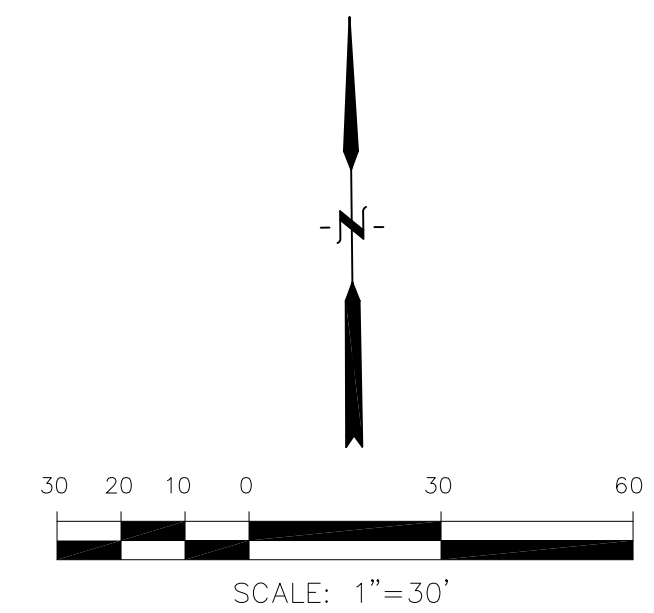
DATE: NOV 12, 2020

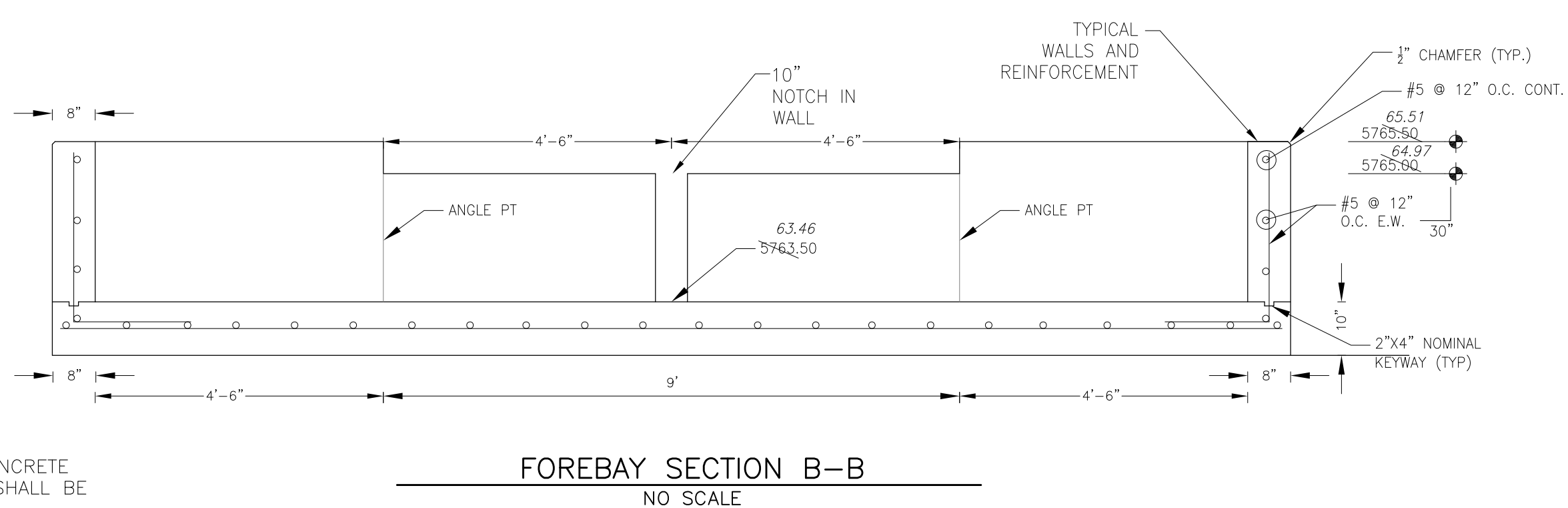
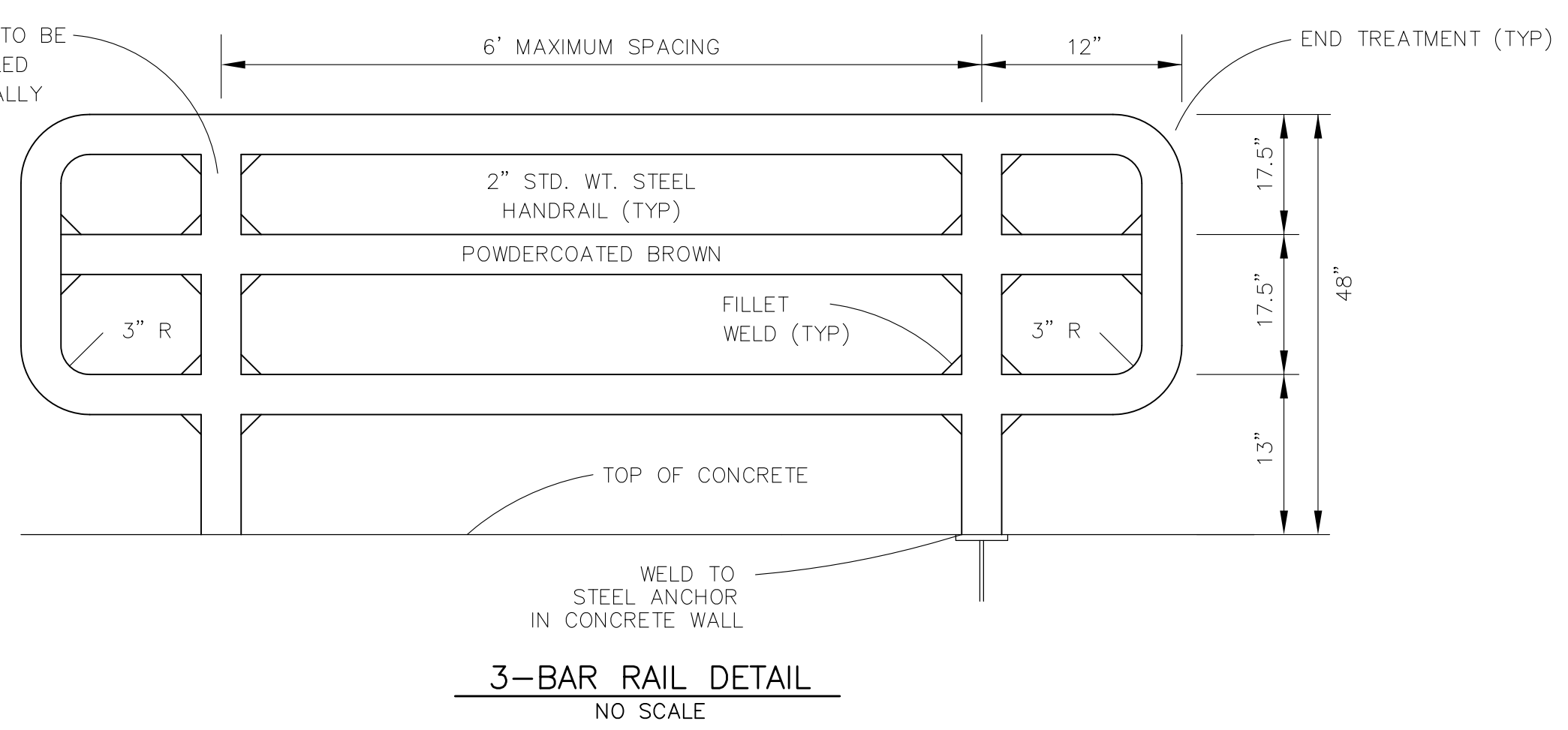
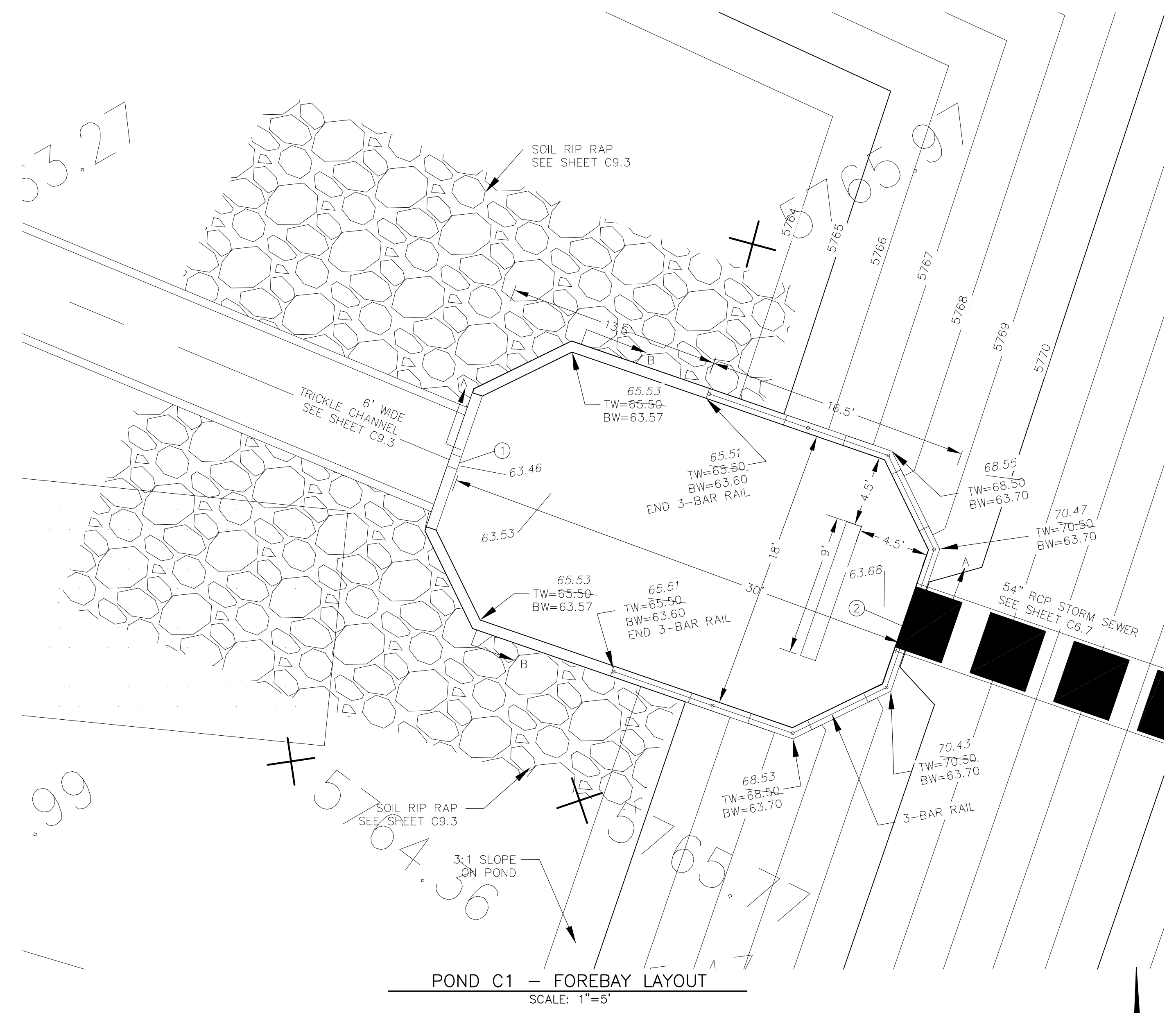
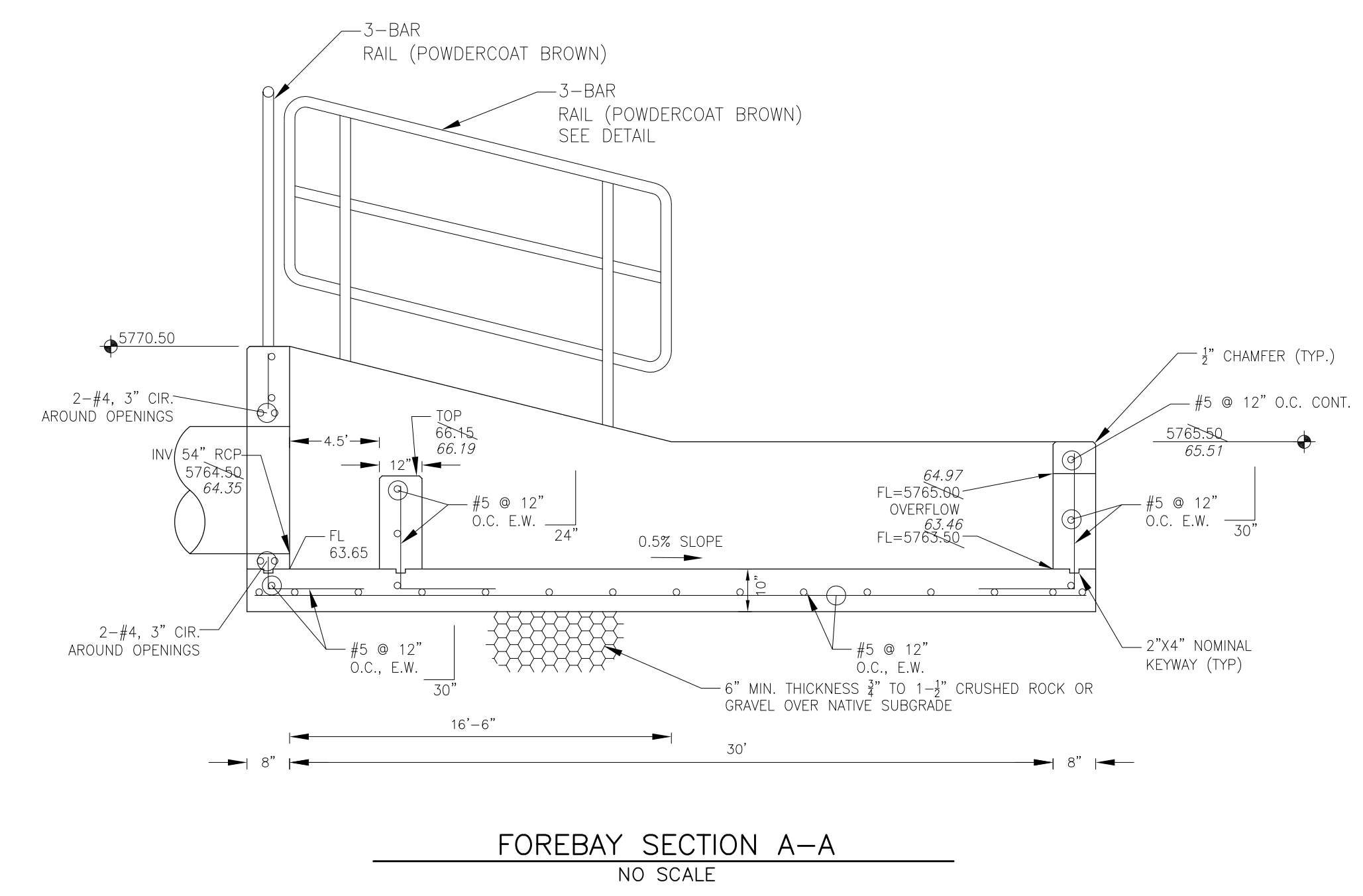
PROJECT NO. 100.061

SHEET NUMBER C9.3

TOTAL SHEETS: 58

**AS-BUILT**  
DATE: 09/30/2022

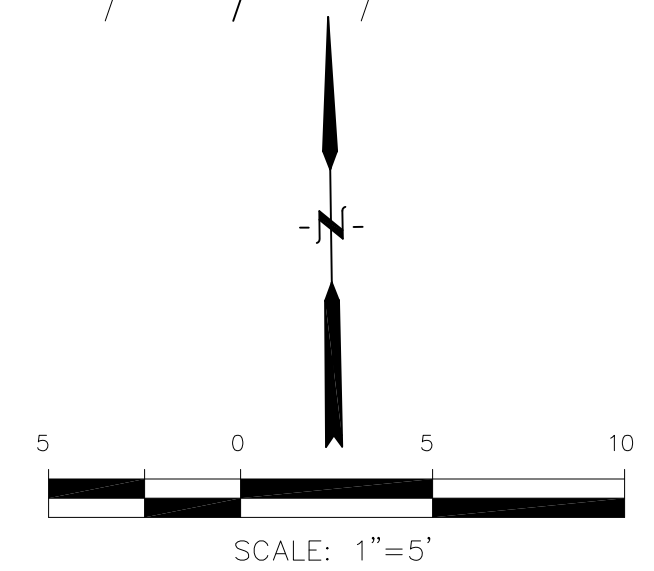




NOTE: ALL CONCRETE FOR FOREBAY SHALL BE CDOT TYPE D

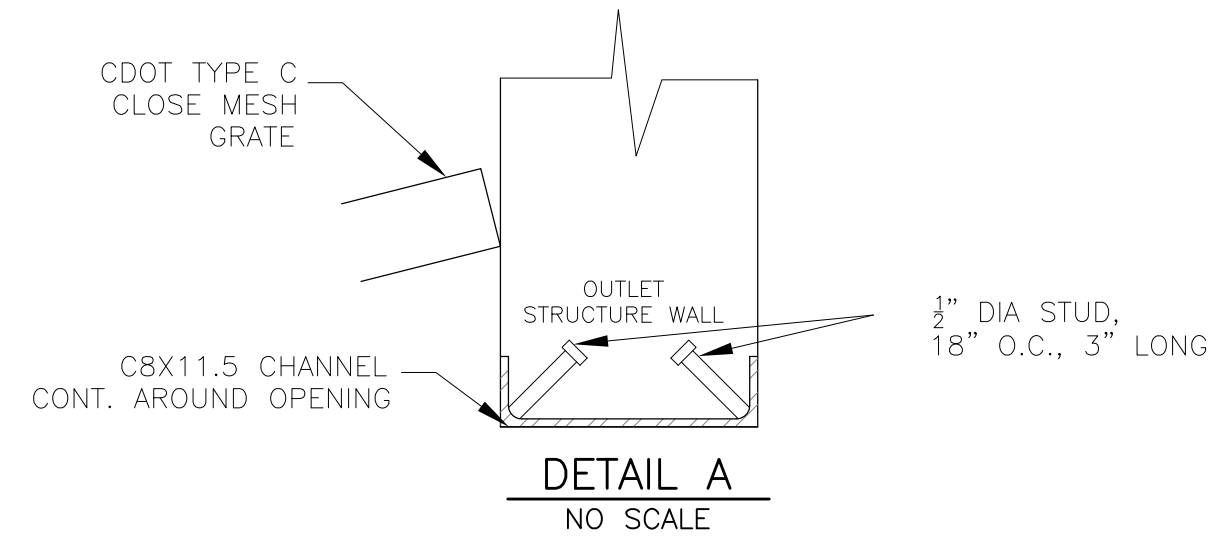
**POINT TABLE (FOREBAY)**

NUMBER	NORTHING	EASTING	ELEVATION	NOTES
1	22830.08	29691.75	5763.50	FOREBAY BOTTOM
2	22820.31	29720.11	5763.65	FOREBAY BOTTOM, INV 54"=5764.50

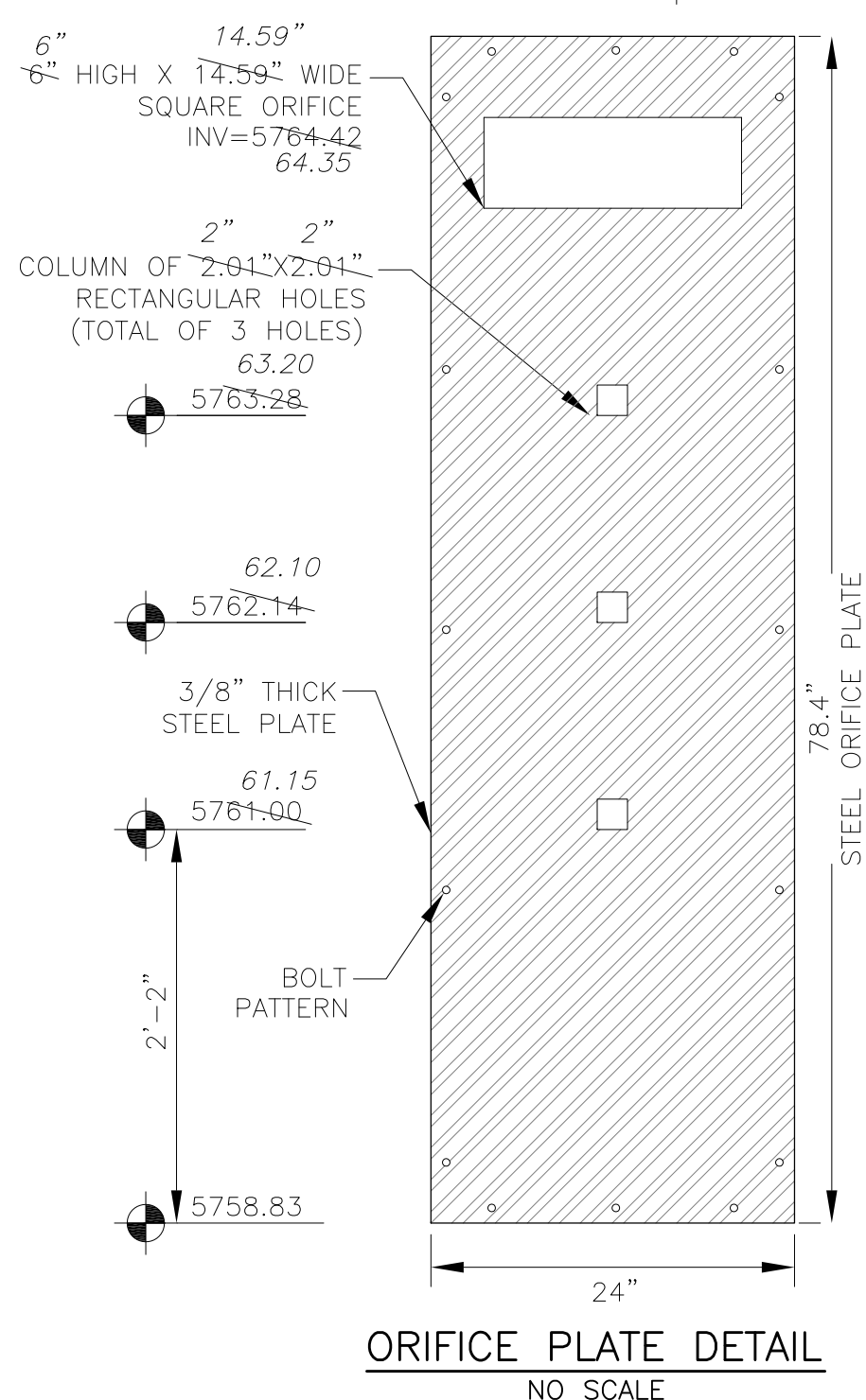
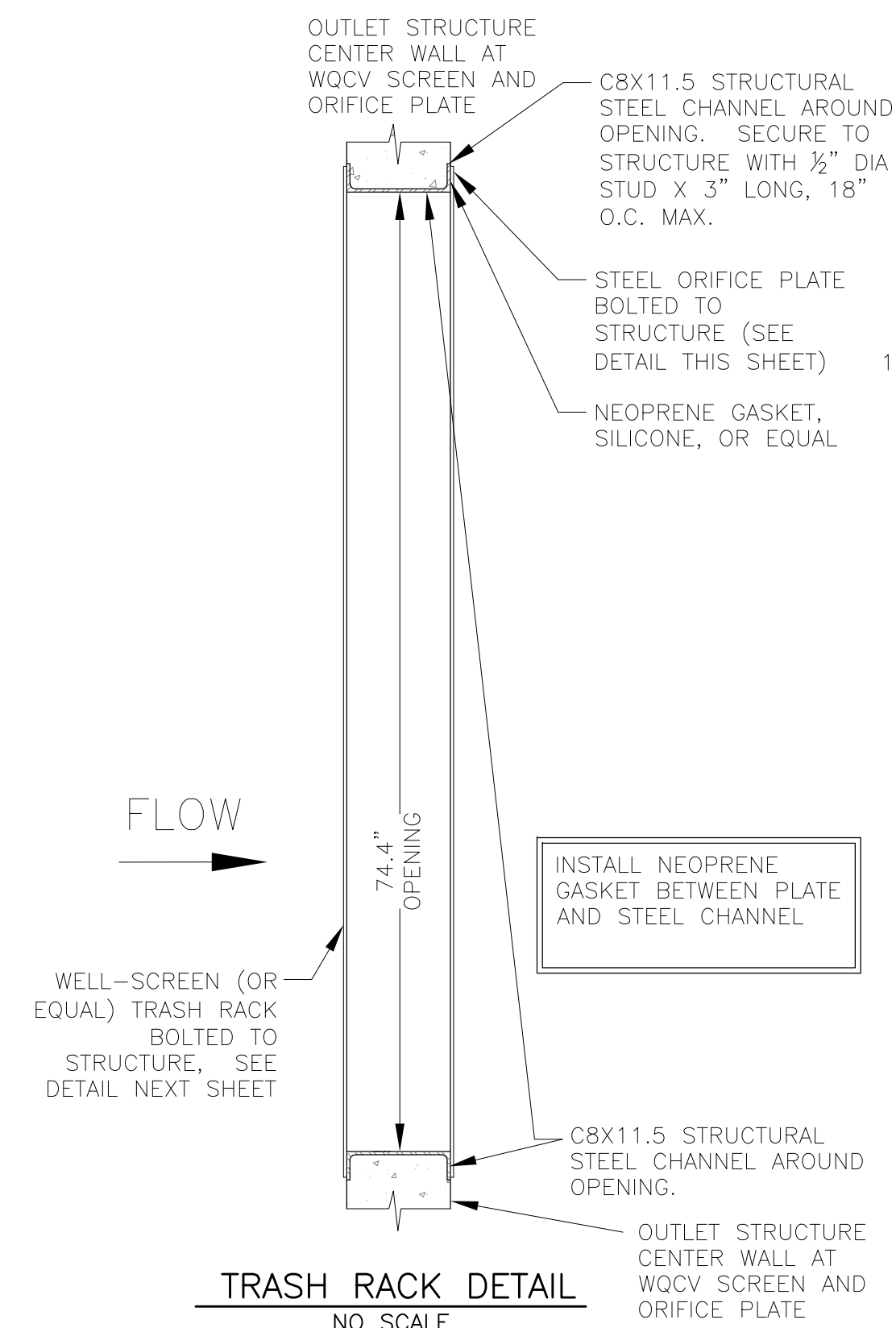
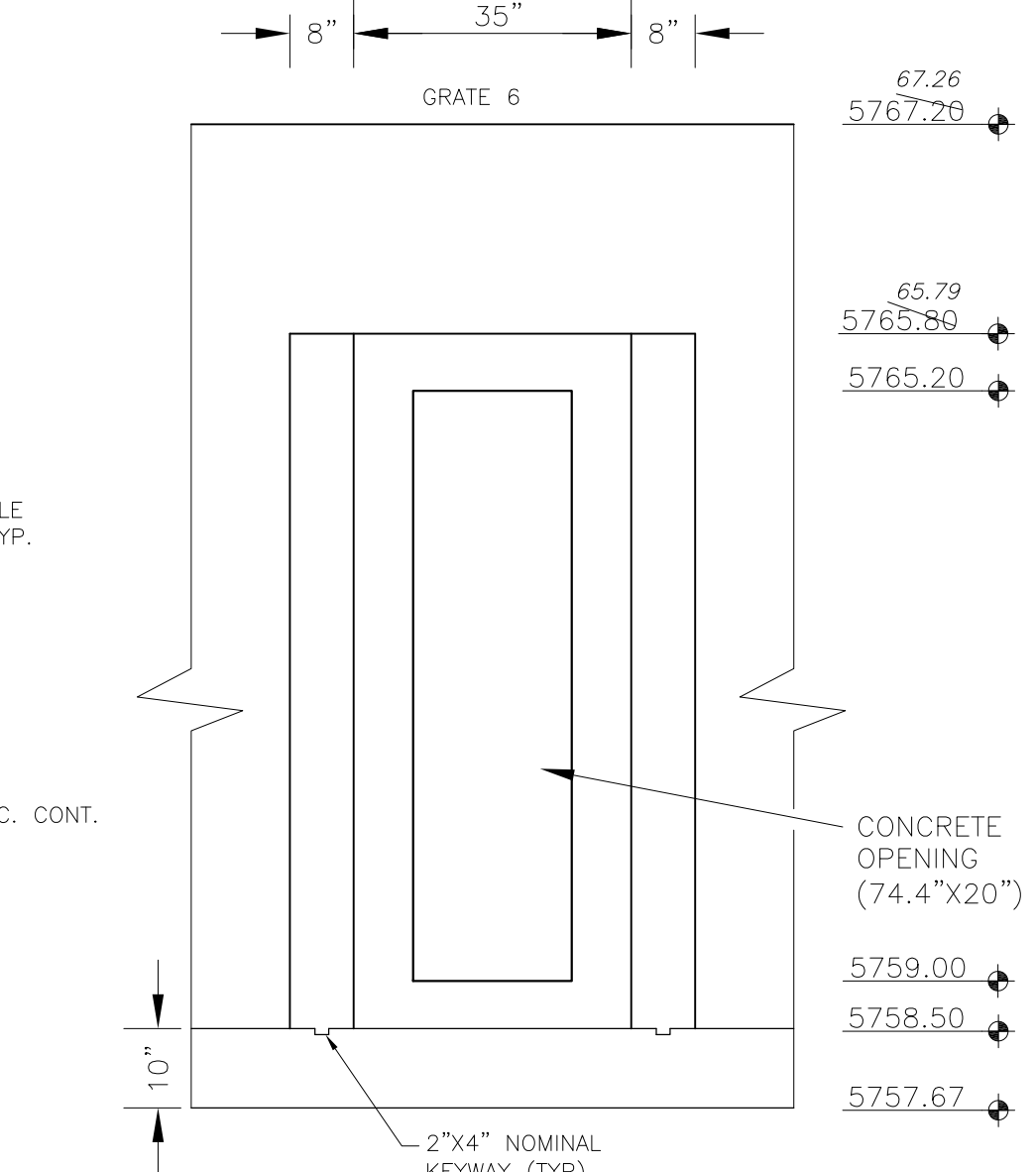
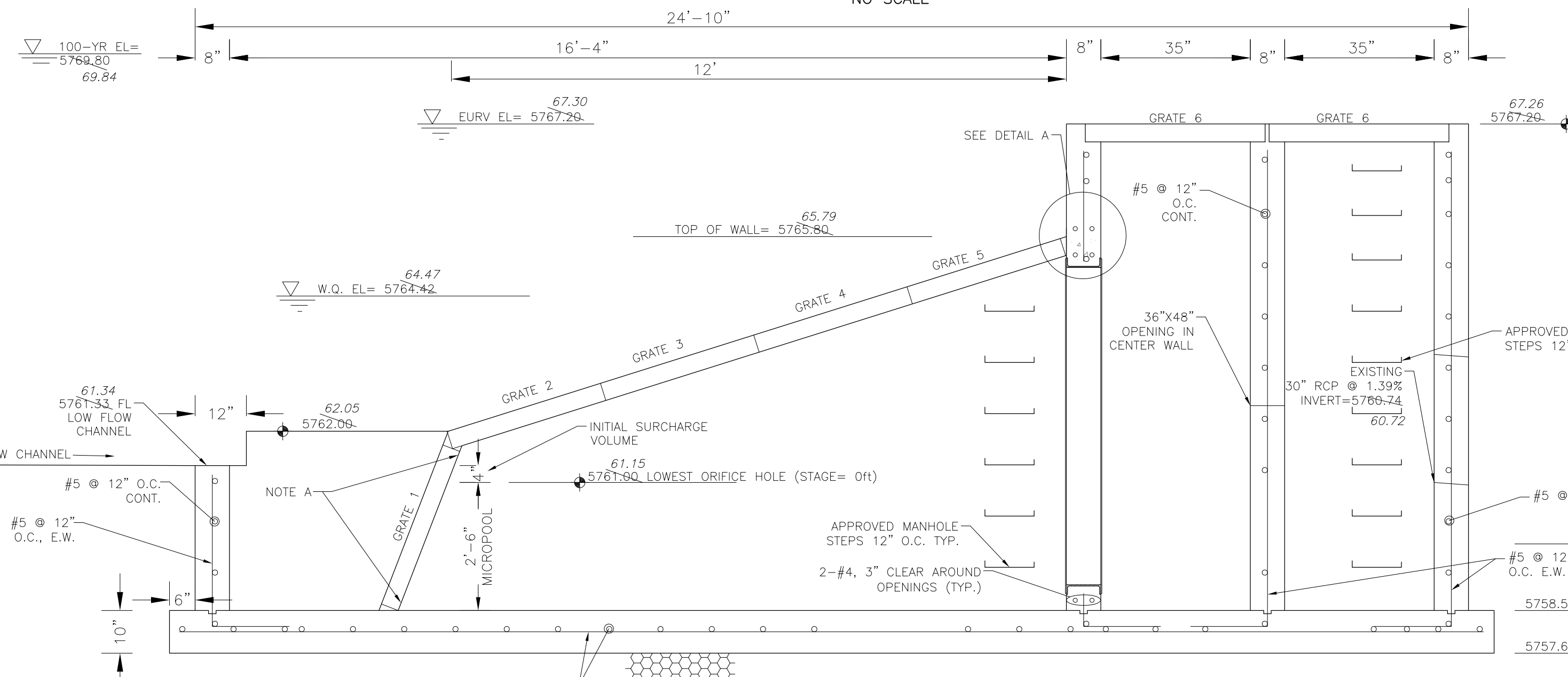
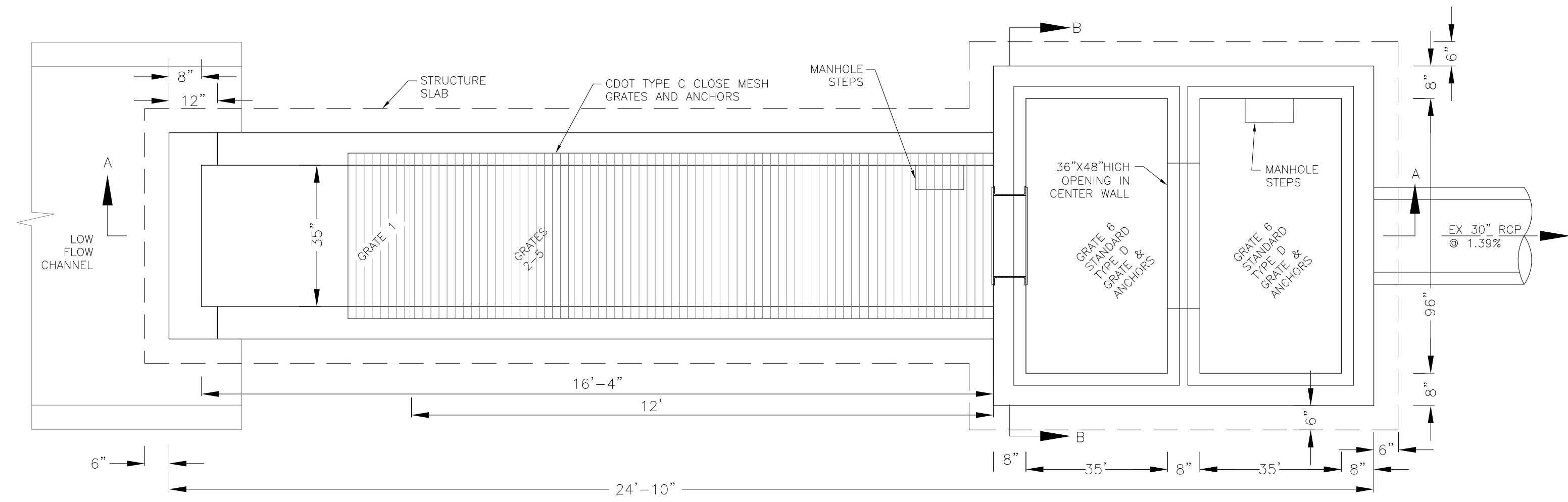
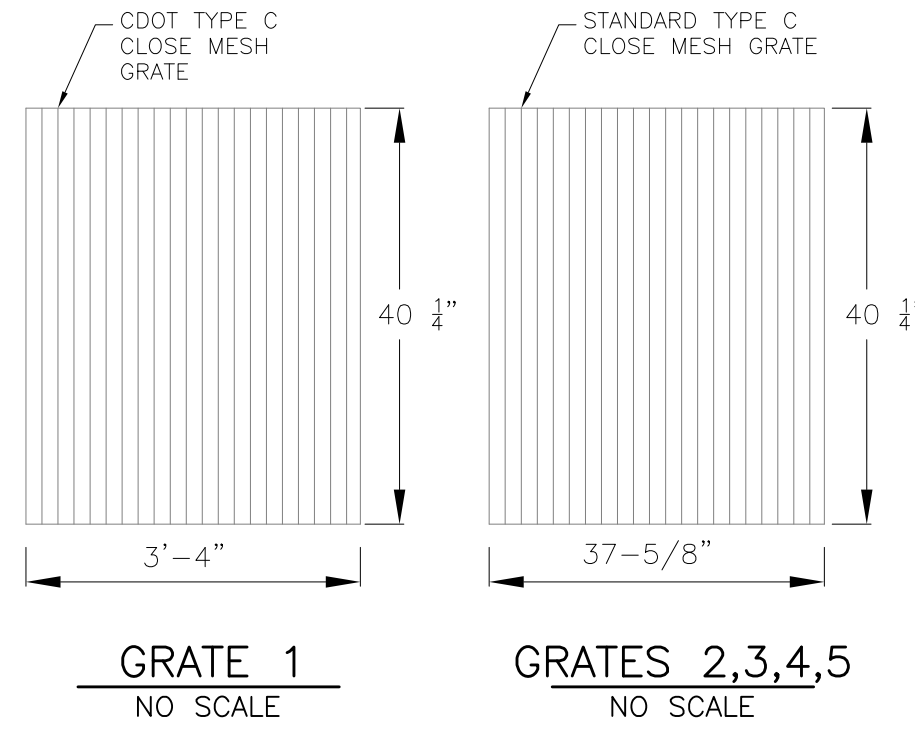


**AS-BUILT**  
 DATE: 09/30/2022





NOTE:  
AFTER CONCRETE STRUCTURE HAS BEEN POURED  
ALL GRATE DIMENSIONS SHALL BE FIELD VERIFIED  
PRIOR TO GRATE CONSTRUCTION



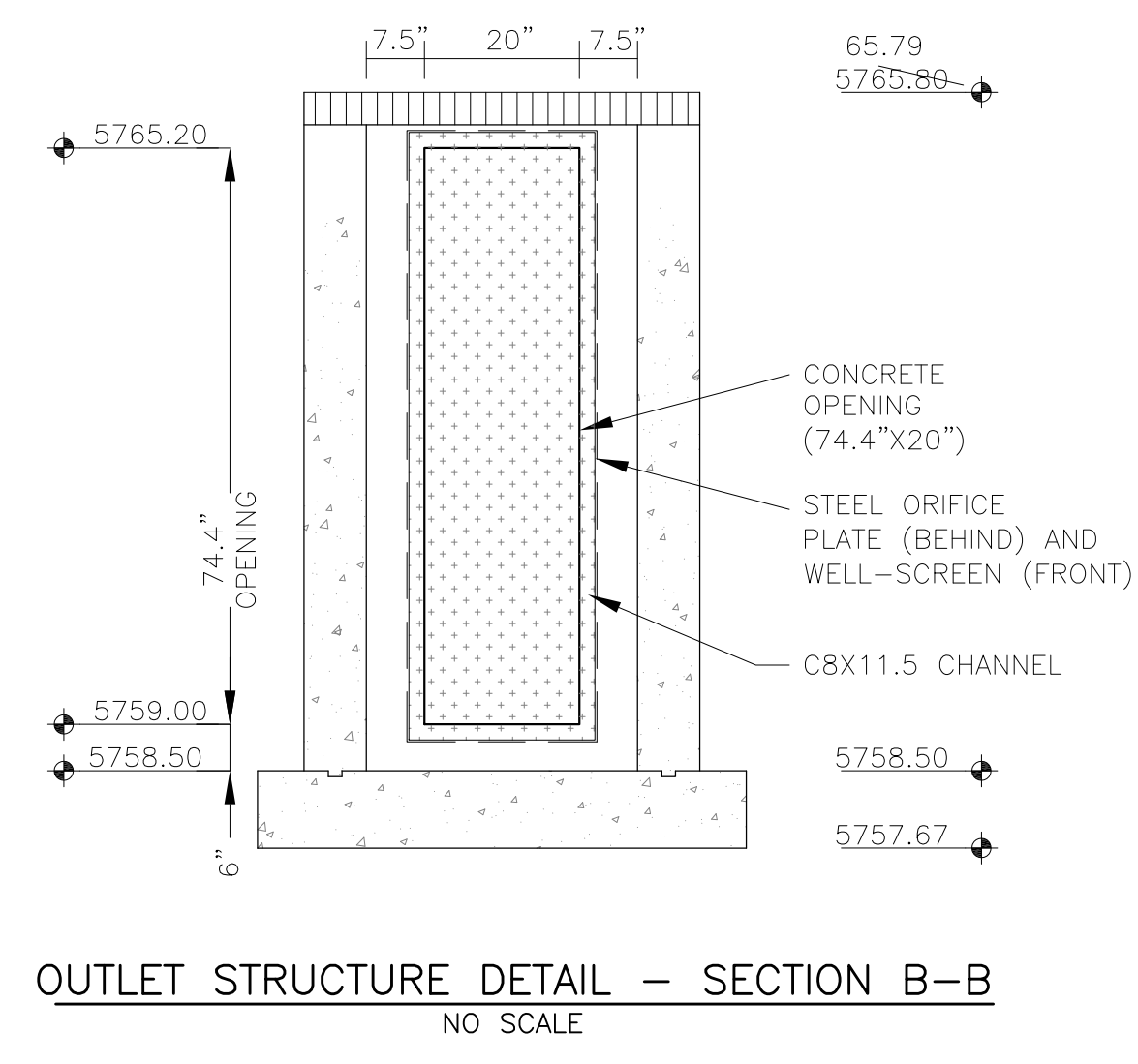
OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:

- PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL COMPONENTS OF THE OUTLET STRUCTURE.
- GRADE 60 REINFORCING STEEL REQUIRED. SEE TABLE FOR THE MINIMUM LAP SPLICE LENGTH FOR REINFORCING BARS. ALL REINFORCING STEEL SHALL HAVE A TWO-INCH MINIMUM CLEARANCE FROM EDGE OF CONCRETE, UNLESS OTHERWISE NOTED.
- CONCRETE FOR THE OUTLET STRUCTURE AND FOREBAY SHALL BE CDOT CLASS D CONCRETE.
- CONCRETE FOR DRAIN CHANNELS SHALL BE CDOT CLASS B CONCRETE
- EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M-213. EXPANSION JOINT MATERIAL SHALL BE 1/2" THICK, SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE AND THE JOINT SHALL BE SEALED, REFER TO DETAILS.
- ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 3/8" CHAMFER UNLESS OTHERWISE NOTED.
- SUBGRADE TO BE 12" THICK CLEAN FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM M698 UNDER STRUCTURE.
- REFER TO POND DETAILS FOR PRESEDIMENTATION/FOREBAY DESIGN.
- ENGINEER SHALL BE NOTIFIED PRIOR TO BEGINNING CONSTRUCTION OF OUTLET STRUCTURE TO SCHEDULE OBSERVATION VISITS FOR STRUCTURES.

BAR SIZE	#4	#5	#6
MIN. SPLICE LENGTH	1'-3"	1'-7"	2'-0"

WQCV WELL-SCREEN NOTES:

- Well-Screen shall be stainless steel and attached by stainless steel bolts along edge of the mounting frame.
- WQCV Well Screen
  - Type of Screen: Stainless steel #93 Vee Wire (Johnson Vee Wire (tm) Stainless Steel Screen or equivalent with 60% open area)
  - Screen slot opening dimension: 0.139" (Screen #93 Vee Wire Slot Opening)
  - Type and Size of Support Rod: TE 0.074"X0.50"
  - Spacing of Support Rod (O.C.): 1.0 Inch
  - Total Screen Thickness: 0.655"
  - Carbon Steel Holding Frame Type: 3/4" x 1.0" angle



**AS-BUILT**  
DATE: 09/30/2022

**CORE ENGINEERING GROUP**  
15004 1ST AVENUE S.  
DENVER, CO 80206  
PH: 719.570.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@cgei.com

DATE: \_\_\_\_\_  
DESCRIPTION: \_\_\_\_\_  
NO: \_\_\_\_\_  
PREPARED FOR: **LORSON, LLC**  
212 N. WAHSATCH AVE, SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
(719) 635-3200  
CONTACT: JEFF MARK

DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

PROJECT: **THE RIDGE AT LORSON**  
FONTAINE BLVD. - WALLEYE DR  
COLORADO SPRINGS, COLORADO

**POND C2.1**  
**FULL SPECTRUM**  
**OUTLET STRUCTURE DETAILS**

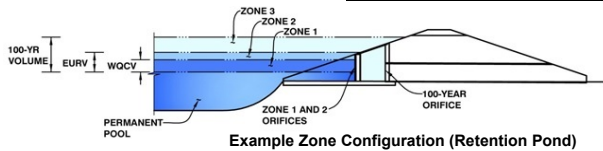
DATE: NOV 5, 2021  
PROJECT NO: 100.064  
SHEET NUMBER: **C9.4**  
TOTAL SHEETS: 23



# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

**Project:** The Hills at Lorson Ranch  
**Basin ID:** Pond C2.2-asbuilt



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.40	0.827	Orifice Plate
Zone 2 (EURV)	5.40	1.824	Rectangular Orifice
Z3 (100+1/2WQCV)	7.54	2.269	Weir&Pipe (Restrict)
<b>Total (all zones)</b>		<b>4.920</b>	

**User Input:** Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =  ft (distance below the filtration media surface)  
 Underdrain Orifice Diameter =  inches

**Calculated Parameters for Underdrain**  
 Underdrain Orifice Area =  ft<sup>2</sup>  
 Underdrain Orifice Centroid =  feet

**User Input:** Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =  ft (relative to basin bottom at Stage = 0 ft)  
 Depth at top of Zone using Orifice Plate =  ft (relative to basin bottom at Stage = 0 ft)  
 Orifice Plate: Orifice Vertical Spacing =  inches  
 Orifice Plate: Orifice Area per Row =  sq. inches (diameter = 1-11/16 inches)

**Calculated Parameters for Plate**  
 WQ Orifice Area per Row =  ft<sup>2</sup>  
 Elliptical Half-Width =  feet  
 Elliptical Slot Centroid =  feet  
 Elliptical Slot Area =  ft<sup>2</sup>

**User Input:** Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.15	2.20					
Orifice Area (sq. inches)	2.21	2.21	2.21					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

**User Input:** Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	<input type="text" value="3.30"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	<input type="text" value="5.40"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	<input type="text" value="6.00"/>	<input type="text" value="N/A"/>	inches
Vertical Orifice Width =	<input type="text" value="6.00"/>	<input type="text" value="N/A"/>	inches

**Calculated Parameters for Vertical Orif**  
 Vertical Orifice Area =  ft<sup>2</sup>  
 Vertical Orifice Centroid =  feet

**User Input:** Overflow Weir (Dropbox with Flat or Sloped Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe).

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	<input type="text" value="7.06"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	<input type="text" value="8.00"/>	<input type="text" value="N/A"/>	feet
Overflow Weir Gate Slope =	<input type="text" value="0.00"/>	<input type="text" value="N/A"/>	H:V
Horiz. Length of Weir Sides =	<input type="text" value="6.00"/>	<input type="text" value="N/A"/>	feet
Overflow Gate Open Area % =	<input type="text" value="70%"/>	<input type="text" value="N/A"/>	% , gate open area/total area
Debris Clogging % =	<input type="text" value="50%"/>	<input type="text" value="N/A"/>	%

**Calculated Parameters for Overflow Weir**  
 Height of Gate Upper Edge, H<sub>t</sub> =  feet  
 Overflow Weir Slope Length =  feet  
 Gate Open Area / 100-yr Orifice Area =  N/A  
 Overflow Gate Open Area w/o Debris =  N/A  
 Overflow Gate Open Area w/ Debris =  N/A

**User Input:** Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	<input type="text" value="0.00"/>	<input type="text" value="N/A"/>	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	<input type="text" value="30.00"/>	<input type="text" value="N/A"/>	inches
Restrictor Plate Height Above Pipe Invert =	<input type="text" value="18.50"/>	<input type="text" value="N/A"/>	inches

**Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate**  
 Outlet Orifice Area =  ft<sup>2</sup>  
 Outlet Orifice Centroid =  feet  
 Half-Central Angle of Restrictor Plate on Pipe =  N/A

**User Input:** Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	<input type="text" value="10.13"/>	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	<input type="text" value="20.00"/>	feet
Spillway End Slopes =	<input type="text" value="4.00"/>	H:V
Freeboard above Max Water Surface =	<input type="text" value="1.49"/>	feet

**Calculated Parameters for Spillway**  
 Spillway Design Flow Depth =  feet  
 Stage at Top of Freeboard =  feet  
 Basin Area at Top of Freeboard =  acres  
 Basin Volume at Top of Freeboard =  acre-ft

micropool = 0 = 5743.90

## Routed Hydrograph Results

*The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF)*

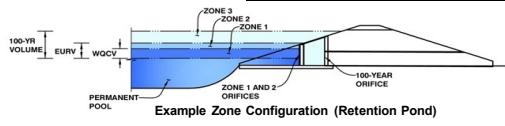
	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =								
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	0.827	2.651	2.510	3.521	4.403	5.541	6.487	7.671
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.057	5.655	8.290	11.856	14.864	18.552
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	5.0	13.5	20.5	36.5	45.7	58.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.11	0.30	0.46	0.81	1.02	1.29
Peak Inflow Q (cfs) =	N/A	N/A	41.0	59.5	73.2	94.9	111.3	131.4
Peak Outflow Q (cfs) =	0.4	2.1	2.3	3.9	25.0	40.3	41.5	43.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	1.2	1.1	0.9	0.8
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	0.0	0.7	1.1	1.1	1.2
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	54	59	62	58	53	49	44
Time to Drain 99% of Inflow Volume (hours) =	41	58	65	70	68	66	64	62
Maximum Ponding Depth (ft) =	3.40	5.40	5.86	7.13	7.57	7.80	8.25	9.04
Area at Maximum Ponding Depth (acres) =	0.78	0.99	1.02	1.10	1.13	1.15	1.18	1.23
Maximum Volume Stored (acre-ft) =	0.834	2.659	3.122	4.468	4.959	5.221	5.745	6.698

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)

Project: The Hills at Lorson Ranch

Basin ID: Pond C2.2-asbuilt



Example Zone Configuration (Retention Pond)

Watershed Information

Table with watershed parameters: Selected BMP Type = EDB, Watershed Area = 45.00 acres, Watershed Length = 2,500 ft, Watershed Length to Centroid = 1,200 ft, Watershed Slope = 0.045 ft/ft, Watershed Imperviousness = 55.00%, Percentage Hydrologic Soil Group A = 0.0%, Percentage Hydrologic Soil Group B = 95.0%, Percentage Hydrologic Soil Groups C/D = 5.0%, Target WQCV Drain Time = 40.0 hours, Location for 1-hr Rainfall Depths = User Input.

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Table with water quality and detention parameters: Water Quality Capture Volume (WQCV) = 0.827 acre-feet, Excess Urban Runoff Volume (EURV) = 2.651 acre-feet, 2-yr Runoff Volume (P1 = 1.19 in.) = 2.510 acre-feet, 5-yr Runoff Volume (P1 = 1.5 in.) = 3.521 acre-feet, 10-yr Runoff Volume (P1 = 1.75 in.) = 4.403 acre-feet, 25-yr Runoff Volume (P1 = 2 in.) = 5.541 acre-feet, 50-yr Runoff Volume (P1 = 2.25 in.) = 6.487 acre-feet, 100-yr Runoff Volume (P1 = 2.52 in.) = 7.671 acre-feet, 500-yr Runoff Volume (P1 = 3.14 in.) = 10.104 acre-feet, Approximate 2-yr Detention Volume = 2.035 acre-feet, Approximate 5-yr Detention Volume = 2.778 acre-feet, Approximate 10-yr Detention Volume = 3.600 acre-feet, Approximate 25-yr Detention Volume = 3.912 acre-feet, Approximate 50-yr Detention Volume = 4.081 acre-feet, Approximate 100-yr Detention Volume = 4.507 acre-feet.

Optional User Overrides

Optional User Overrides table with columns for parameter name and value.

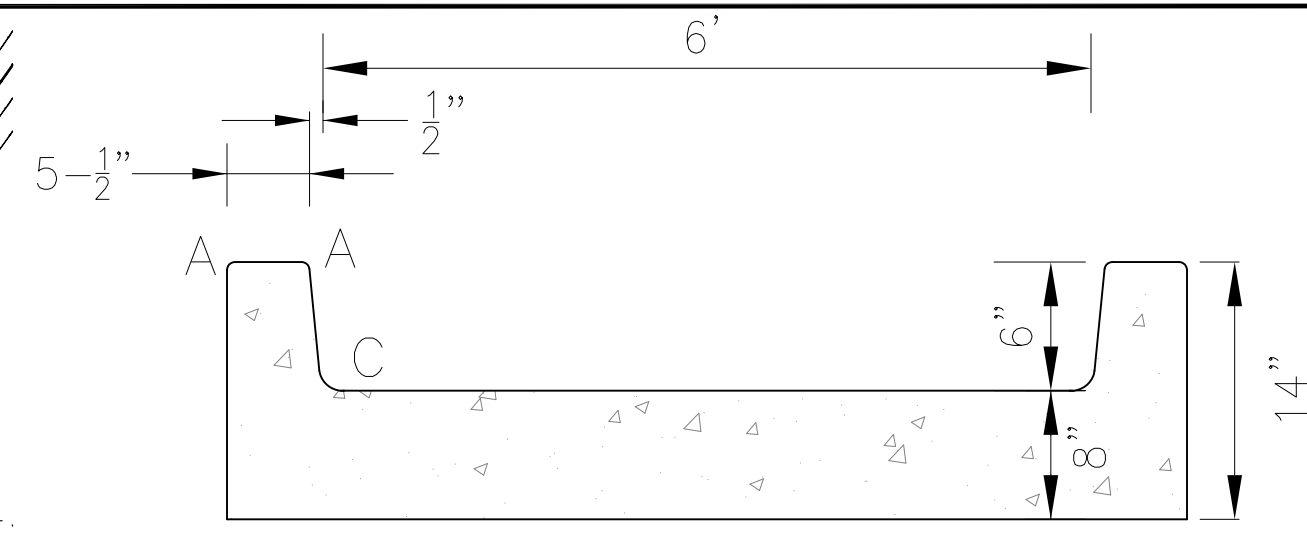
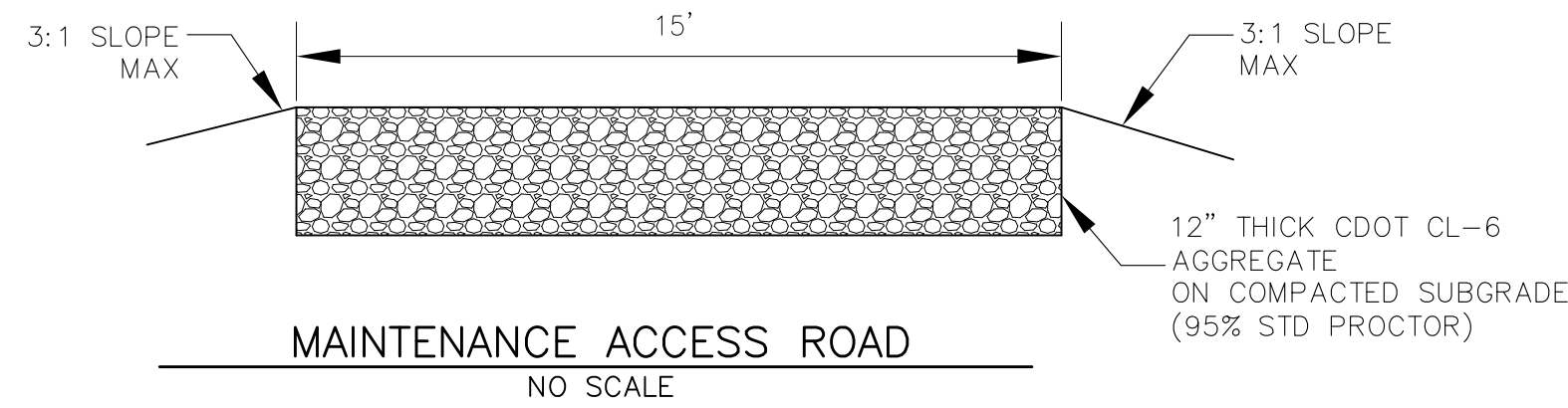
micropool = 0 = 5743.90

Depth Increment = 0.20 ft

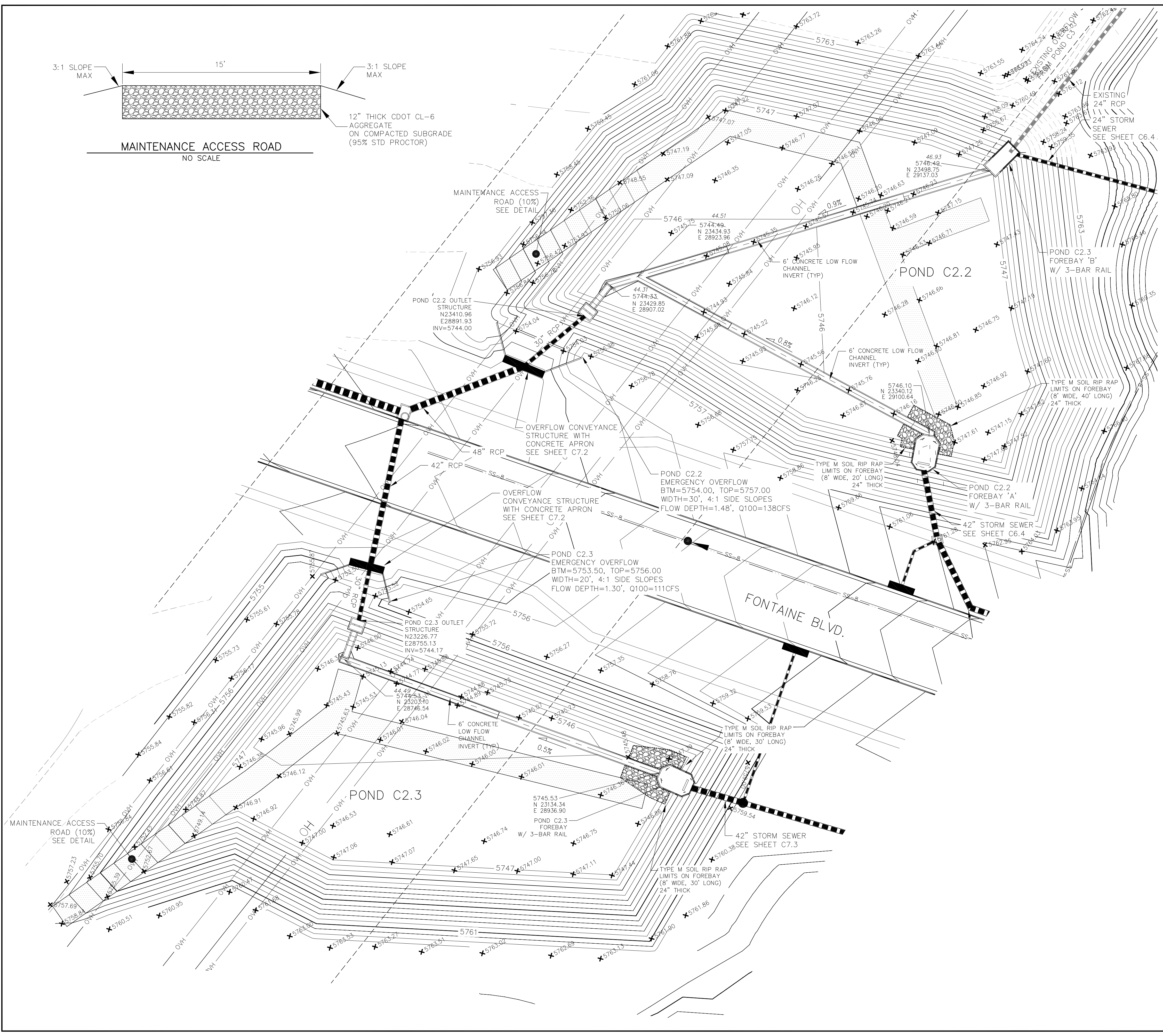
Main Stage-Storage Table with columns: Stage Description, Stage (ft), Optional Override Stage (ft), Length (ft), Width (ft), Area (ft²), Optional Override Area (ft²), Area (acre), Volume (ft³), and Volume (ac-ft). Rows include Stage 5744.33 (Top of Micropool) and subsequent stages up to 5754.







LENGTH FOR RADII	
A	= 1/2"
C	= 1-1/2"



**CORE ENGINEERING GROUP**  
 15004 1ST AVE. SUITE 300  
 BRIGHTON, CO 80601  
 CONTACT: RICHARD L. SCHINDLER, P.E.  
 EMAIL: Rich@cegi.com

DATE: \_\_\_\_\_  
 DESCRIPTION: \_\_\_\_\_  
 NO: \_\_\_\_\_  
 PREPARED FOR: **LORSON, LLC**  
 212 N. WAHSATCH AVE, SUITE 301  
 COLORADO SPRINGS, COLORADO 80903  
 (719) 635-3200  
 CONTACT: JEFF MARK

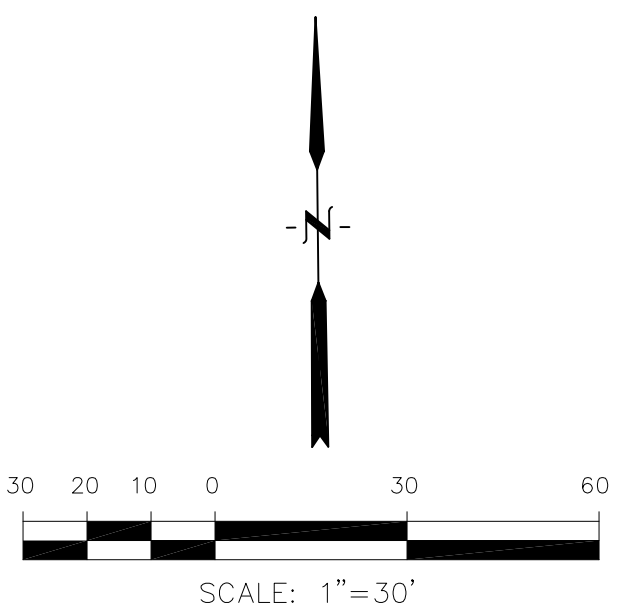
DRAWN: RLS  
 DESIGNED: RLS  
 CHECKED: RLS

**POND C2.2 & C2.3  
 FOREBAY, LOW FLOW CHANNEL  
 AND OUTLET STRUCTURE LAYOUT**

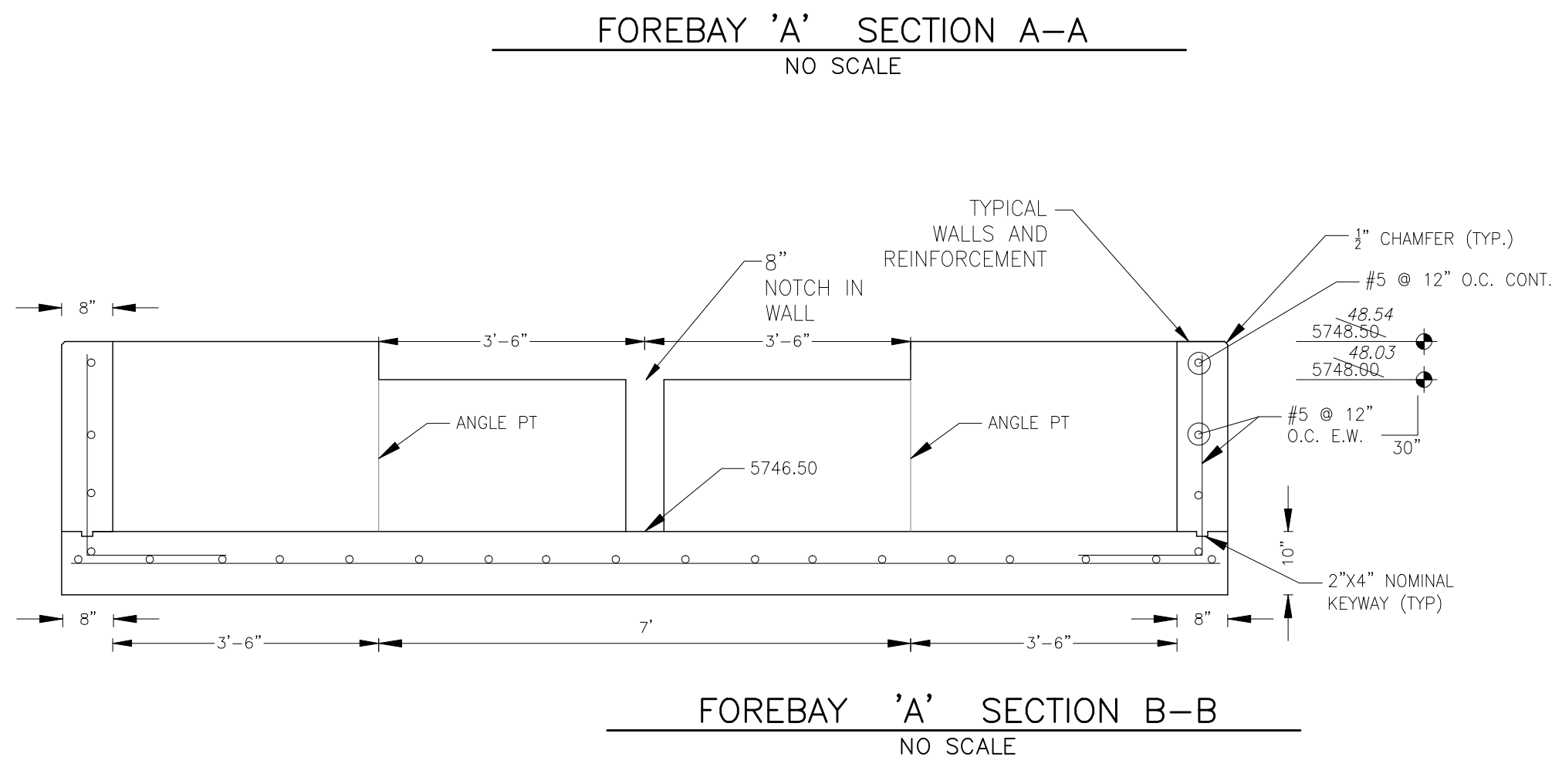
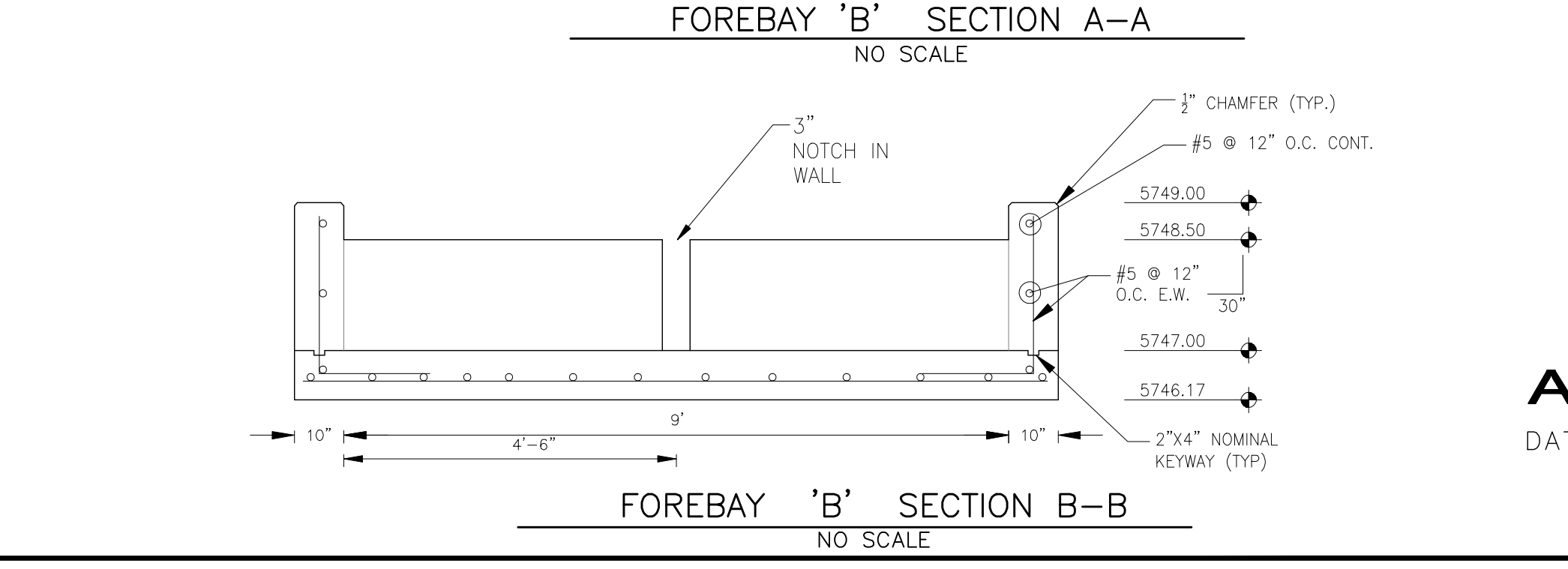
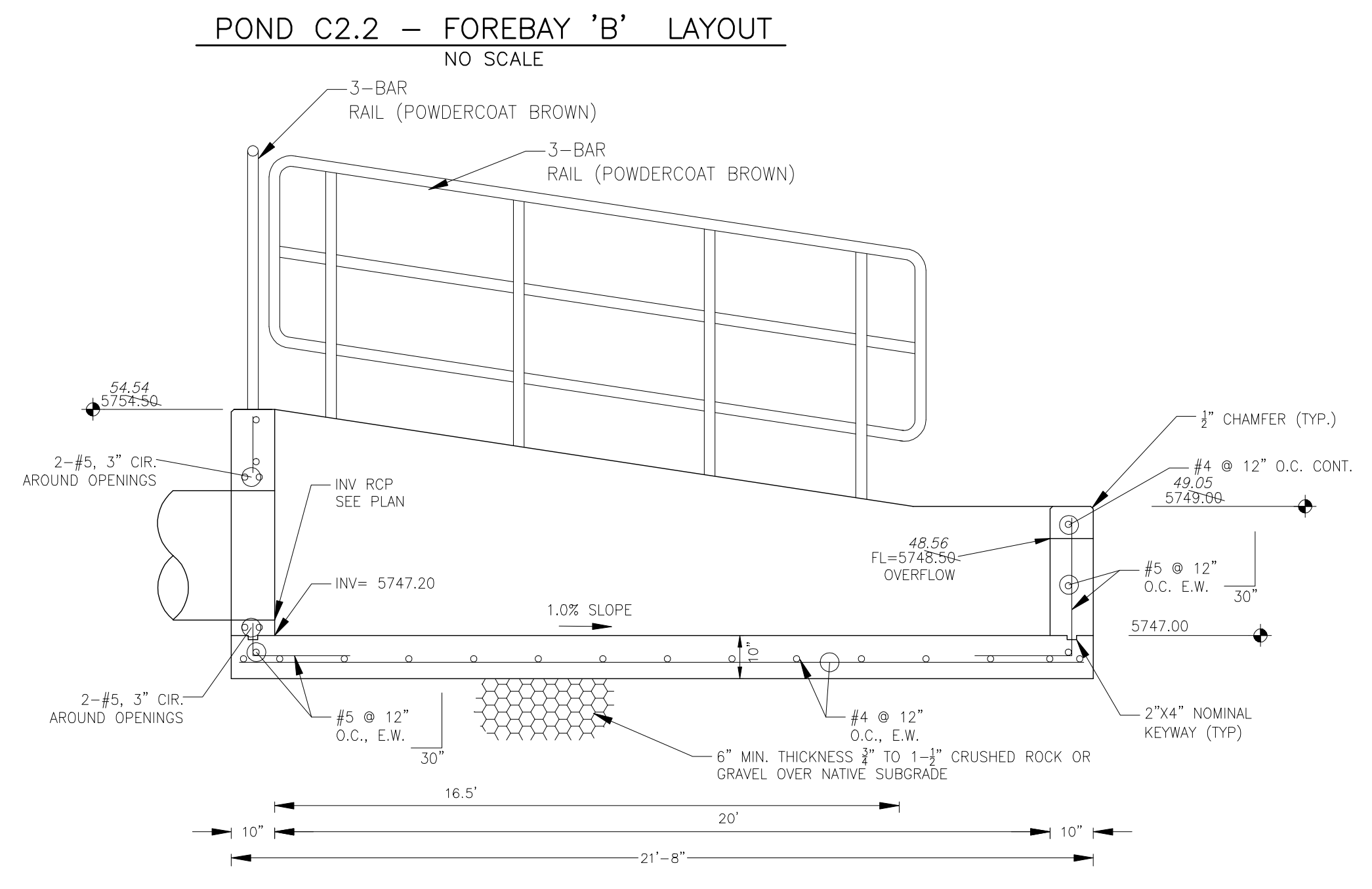
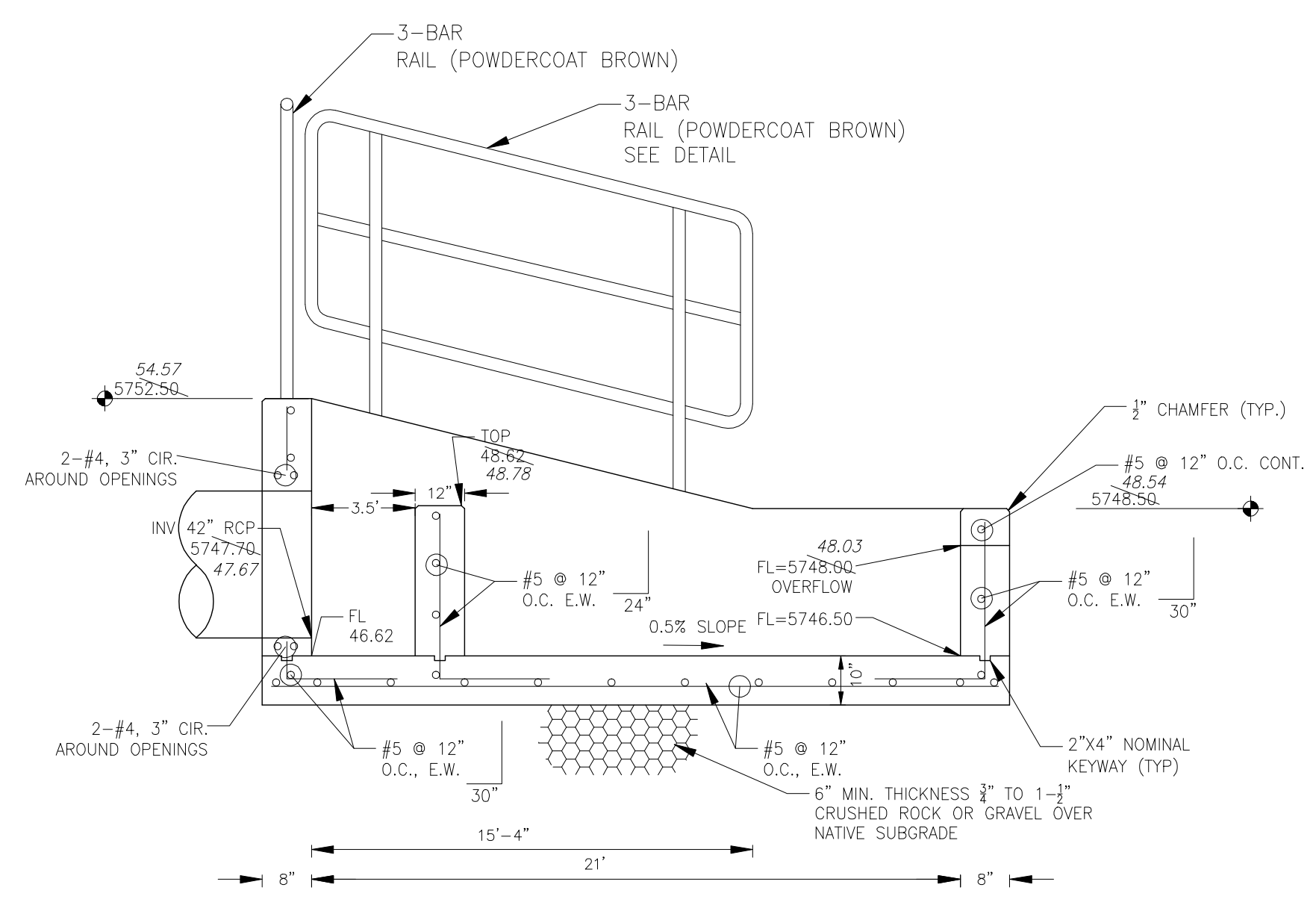
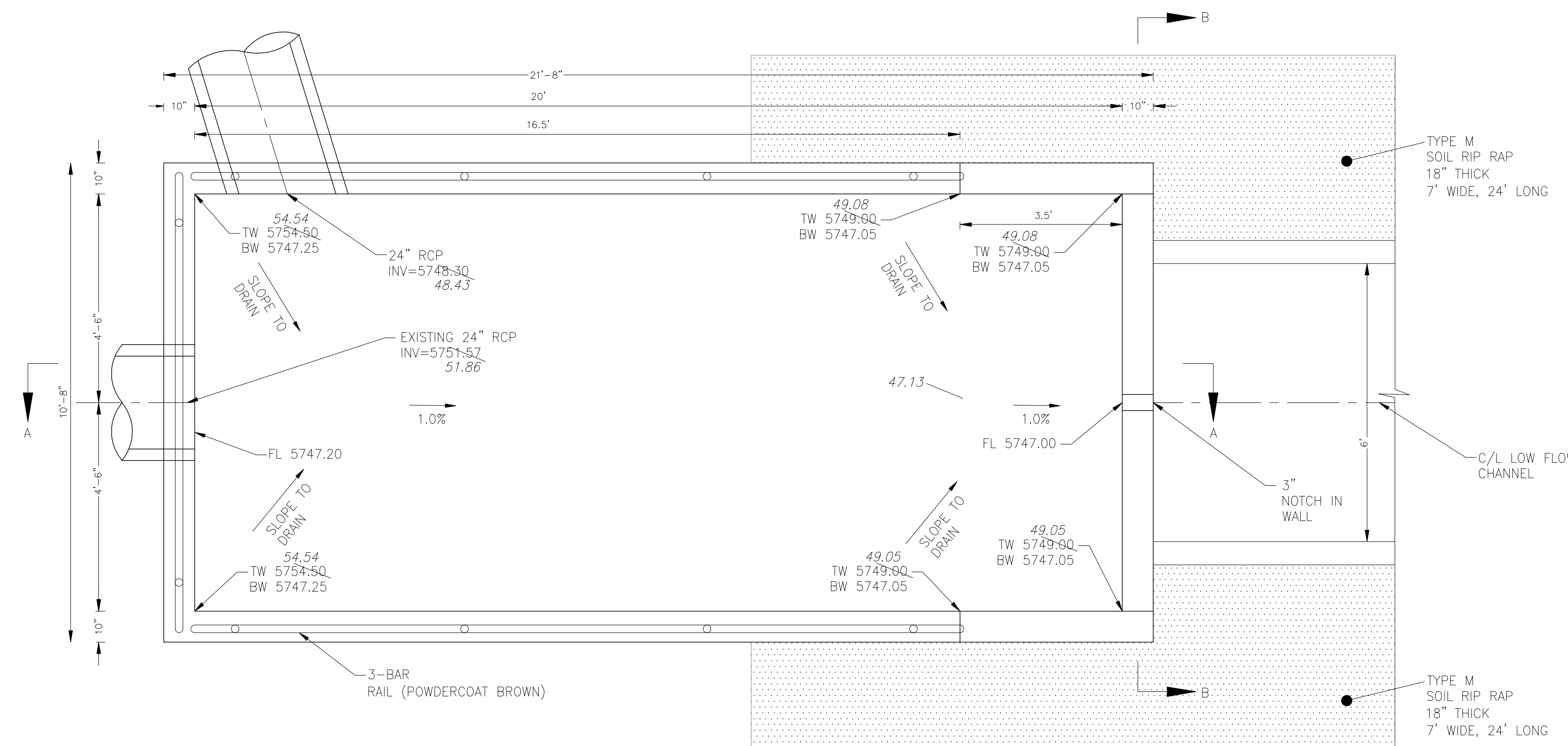
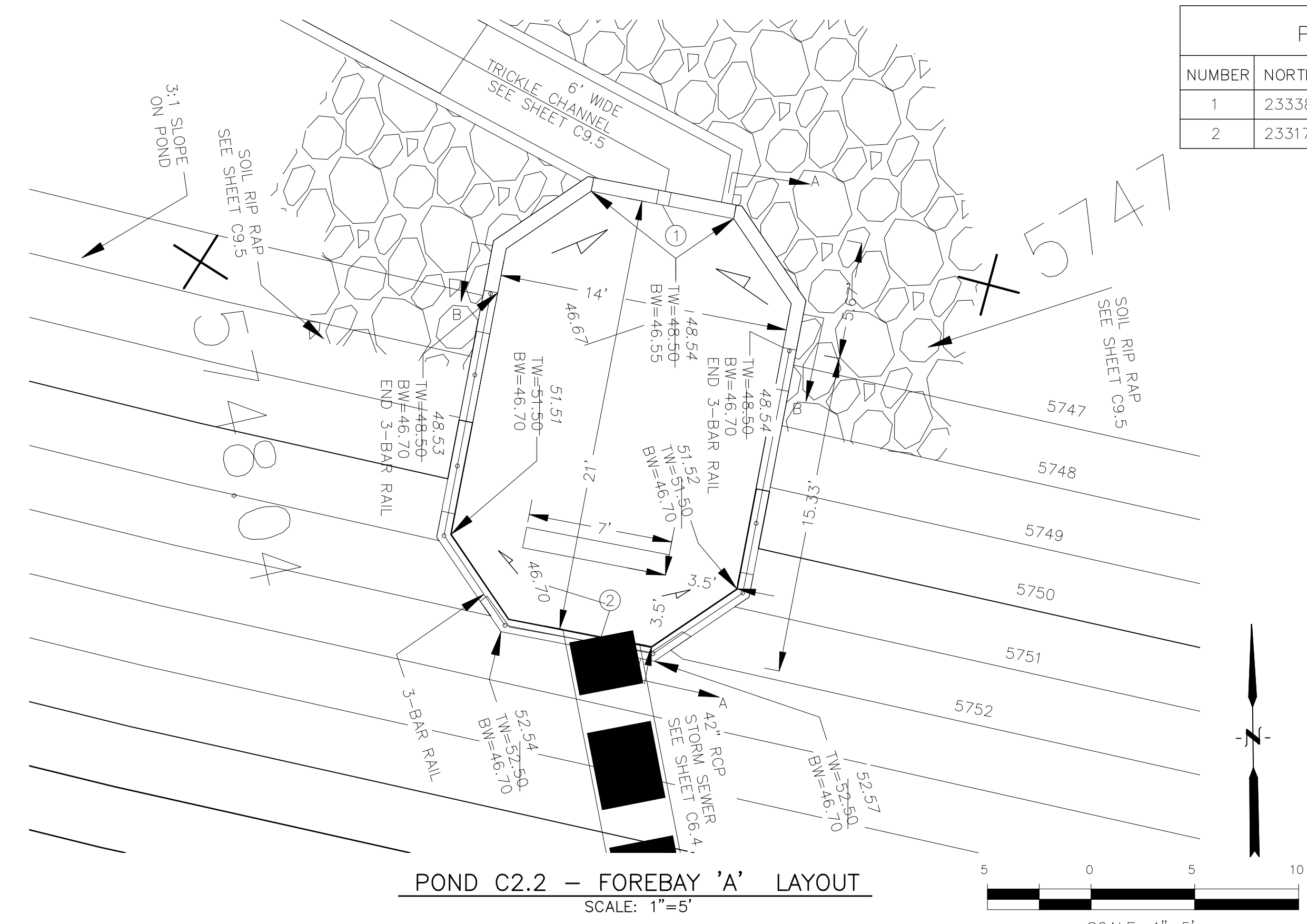


DATE: NOV 12, 2020  
 PROJECT NO. 100.061  
 SHEET NUMBER **C9.5**  
 TOTAL SHEETS: 58

**AS-BUILT**  
 DATE: 09/30/2022



POINT TABLE (FOREBAY)				
NUMBER	NORTHING	EASTING	ELEVATION	NOTES
1	23338.41	29100.32	5746.50	FOREBAY BOTTOM
2	23317.59	29097.36	5746.62	FOREBAY BOTTOM, INV 42"=5747.70



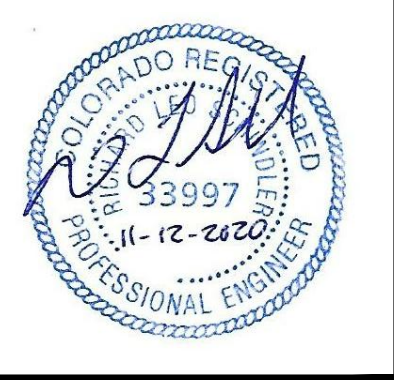
NOTE: ALL CONCRETE FOR FOREBAY SHALL BE CDOT TYPE D

**CORE ENGINEERING GROUP**  
 1500A 1ST AVENUE S.  
 BOULDER, CO 80502  
 PH: 719.570.1100  
 CONTACT: RICHARD L. SCHINDLER, P.E.  
 EMAIL: Rich@ceg1.com

DATE: \_\_\_\_\_  
 DESCRIPTION: \_\_\_\_\_  
 NO: \_\_\_\_\_  
 PREPARED FOR: **LORSON, LLC**  
 212 N. WAHSATCH AVE. SUITE 301  
 COLORADO SPRINGS, COLORADO 80903  
 PROJECT: **THE HILLS COLLECTOR STREET CONSTRUCTION**  
 FONTAINE BLVD. - GRAYLING DR  
 LORSON BLVD - WALLEYE DR - LAMPREY DR  
 COLORADO SPRINGS, COLORADO  
 CONTACT: JEFF MARK

DRAWN: **RLS**  
 DESIGNED: **RLS**  
 CHECKED: **RLS**

**POND C2.2**  
**FOREBAY DETAILS**



DATE: NOV 12, 2020

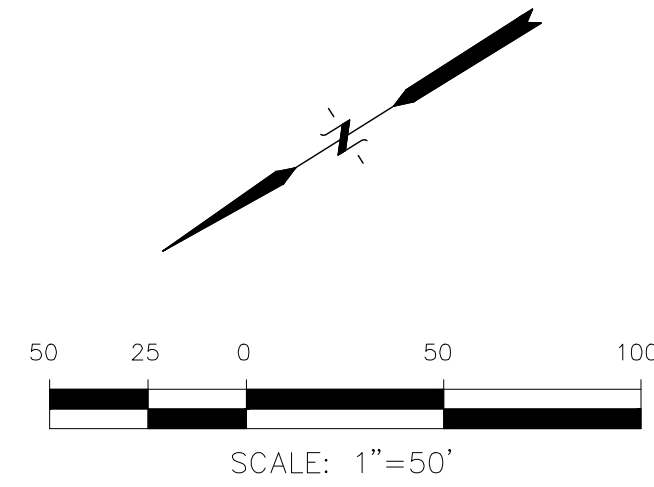
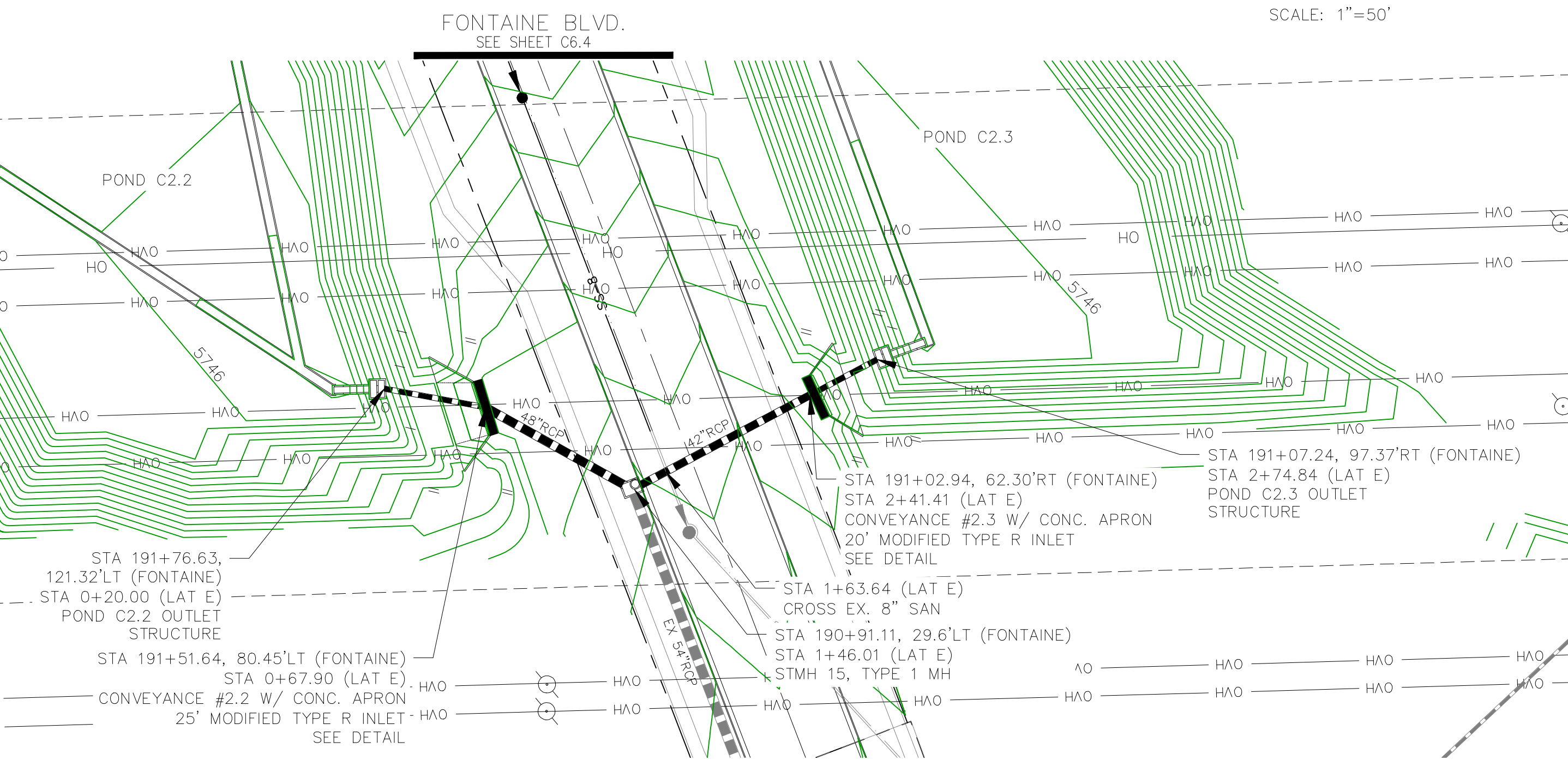
PROJECT NO. 100.061

SHEET NUMBER **C9.6**  
 TOTAL SHEETS: 58

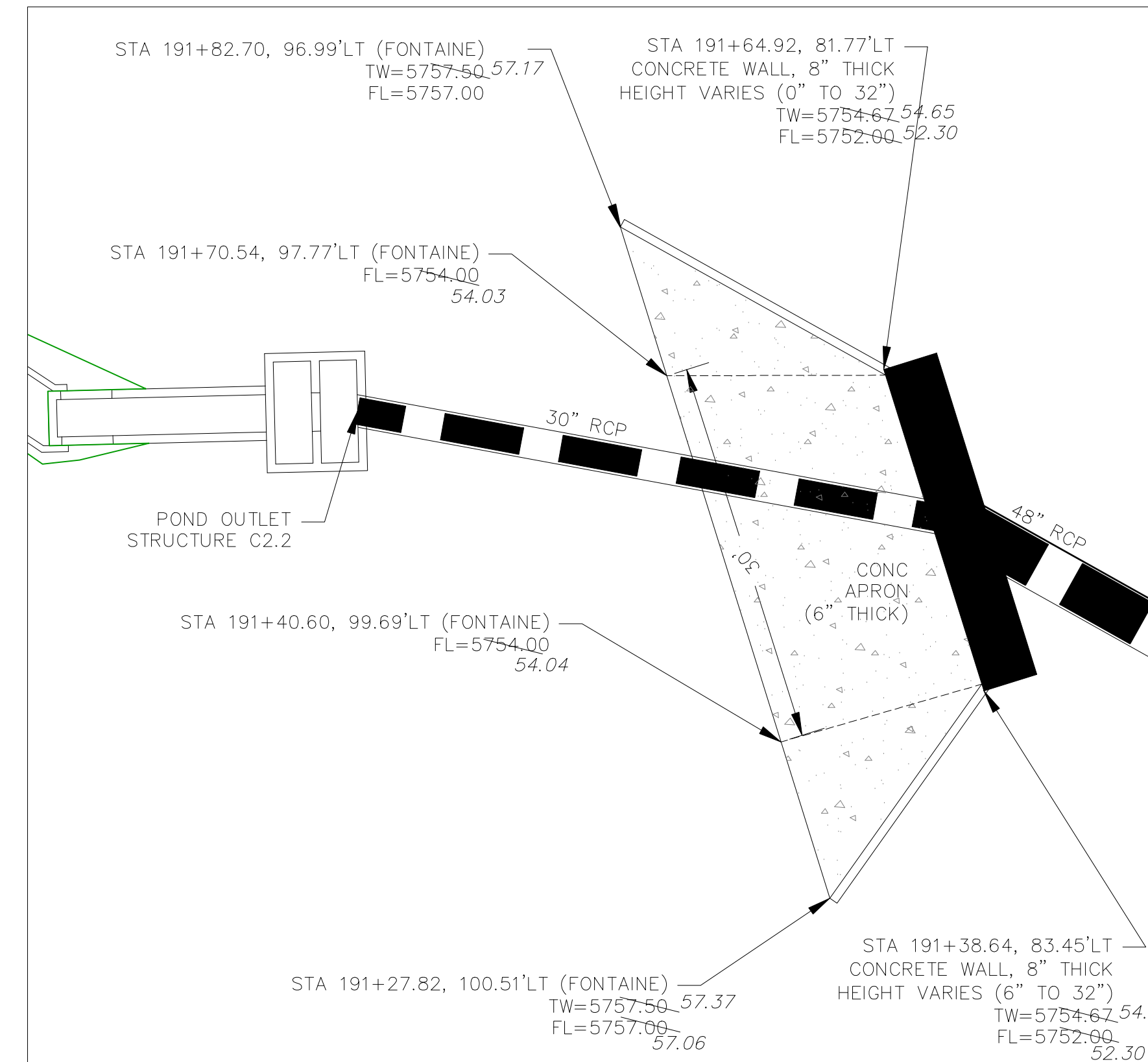
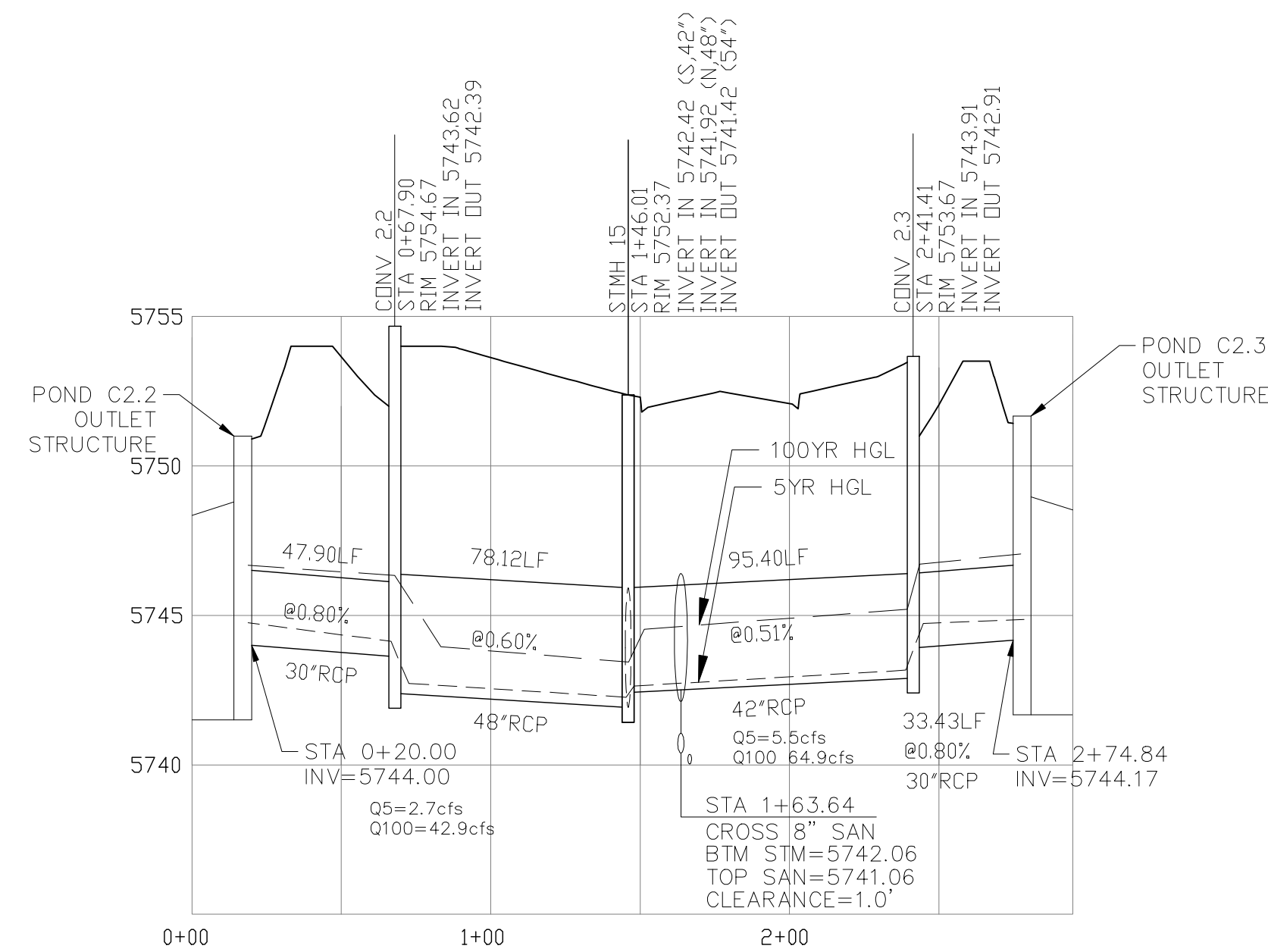
**AS-BUILT**  
 DATE: 09/30/2022

- NOTES**
1. ALL SPOT ELEVATIONS ARE FLOW LINE UNLESS OTHERWISE NOTED.
  2. SEE EARLY GRADING PLAN FOR GRADING INFORMATION.
  3. ALL STORM SEWER SHALL BE CLASS III RCP.
  4. ALL MHS SHALL BE TYPE 1 UNLESS OTHERWISE NOTED.

- 1 CURVE DATA ID
- 2 PEDESTRIAN RAMP, SEE SHEET C10.1
- 3 CURB/GUTTER FLOW LINE POINTS

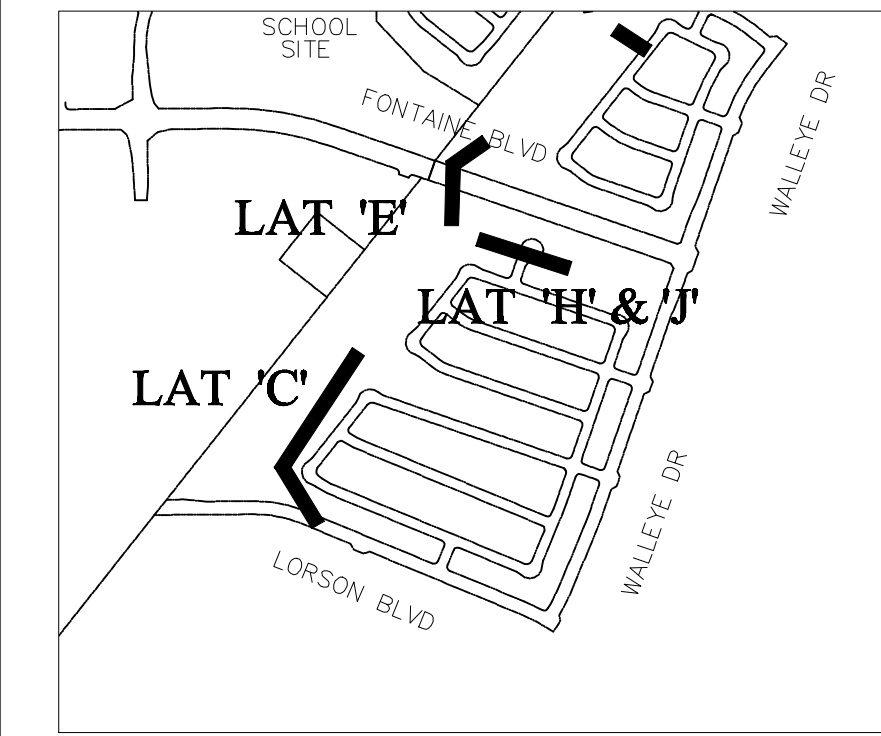


**STORM LATERAL 'E'**



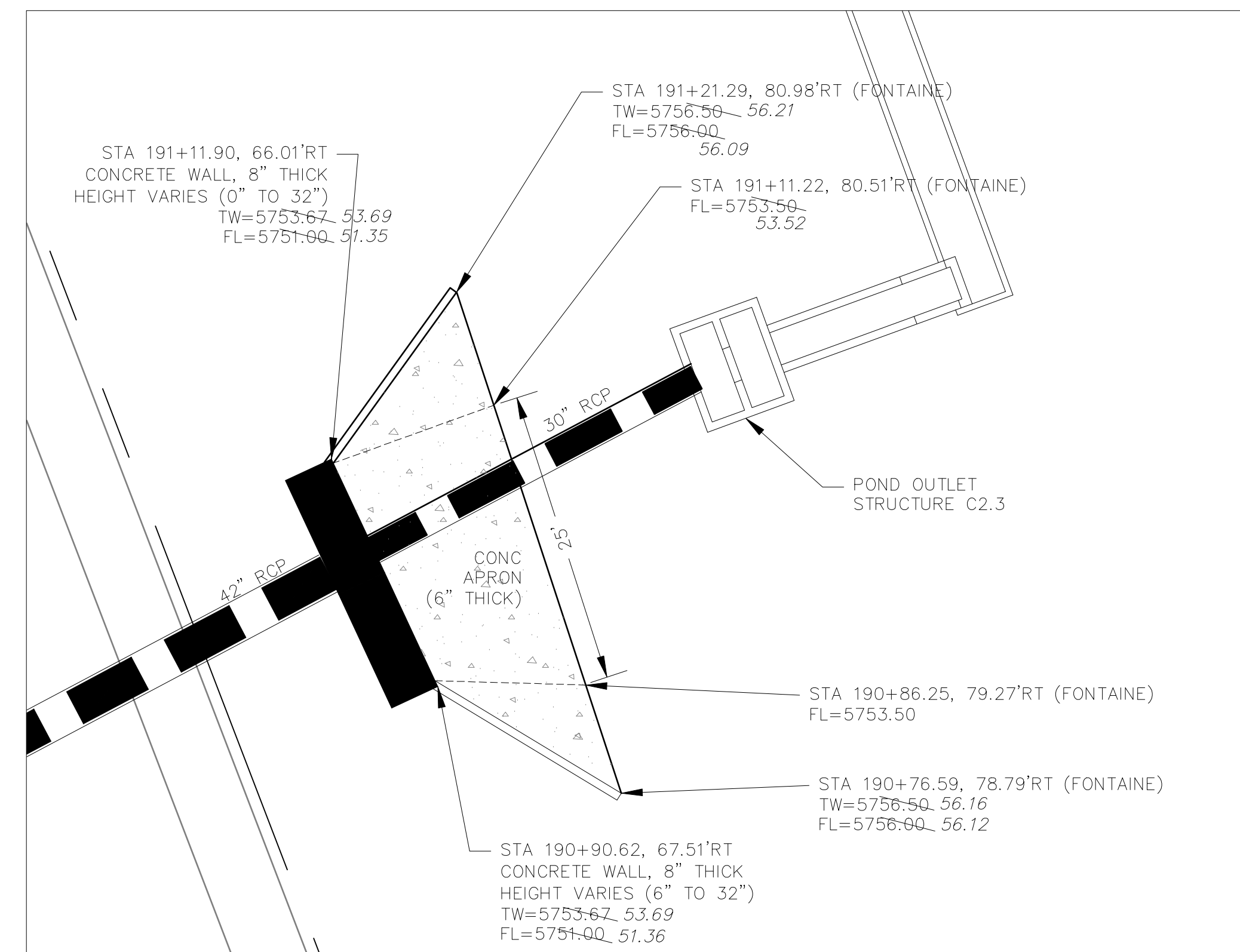
**CONVEYANCE STRUCTURE #2.2**

SCALE: 1"=10'



**CONVEYANCE STRUCTURE #2.2 NOTES:**

1. 25' CDOT TYPE R INLET WITH MODIFIED THROAT OPENING
2. THROAT OPENING = 24"
3. EXTEND 1.25" GALVANIZED STEEL ROD SUPPORTS (TYPE R INLET) TO ACCOMMODATE 24" THROAT OPENING
4. CONCRETE APRON TO BE REINFORCED WITH NO. 4 REBAR, 24" O.C. BOTH WAYS. REBAR TO EXTEND INTO CONCRETE WALL W/ NO. 4 "L" BARS, 18" O.C.
5. CONCRETE WALLS SHALL HAVE A MINIMUM OF TWO HORIZONTAL NO. 4 BARS
6. 24" THROAT OPENING TO INCLUDE SAFETY GRATE.



**CONVEYANCE STRUCTURE #2.3**

SCALE: 1"=10'

**CONVEYANCE STRUCTURE #2.3 NOTES:**

1. 20' CDOT TYPE R INLET WITH MODIFIED THROAT OPENING
2. THROAT OPENING = 24"
3. EXTEND 1.25" GALVANIZED STEEL ROD SUPPORTS (TYPE R INLET) TO ACCOMMODATE 24" THROAT OPENING
4. CONCRETE APRON TO BE REINFORCED WITH NO. 4 REBAR, 24" O.C. BOTH WAYS. REBAR TO EXTEND INTO CONCRETE WALL W/ NO. 4 "L" BARS.
5. CONCRETE WALLS SHALL HAVE A MINIMUM OF TWO HORIZONTAL NO. 4 BARS
6. 24" THROAT OPENING TO INCLUDE SAFETY GRATE.

**AS-BUILT**  
DATE: 09/30/2022

**CORE ENGINEERING GROUP**  
15004 1ST AVENUE S  
DENVER, CO 80202  
PHONE: 719.576.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@cegi.com

DATE: JAN 12, 2021

DESCRIPTION: RAISE SITE 1' EAST OF POWERLINES

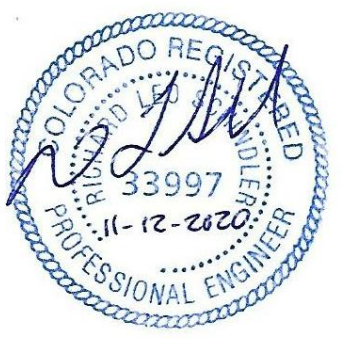
NO. 1

PROJECT: THE HILLS COLLECTOR STREET CONSTRUCTION  
212 N. WAHSATCH AVE SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
LORSON BLVD - GRAYLING DR  
LORSON BLVD - WALLEVE DR - LAMPREY DR  
COLORADO SPRINGS, COLORADO

PREPARED FOR: LORSON, LLC  
CONTACT: JEFF MARK

DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

**STREET & STORM SEWER PLAN/PROFILE**  
**STORM LATERAL 'E'**  
**CONVEYANCE #2.2 & #2.3**

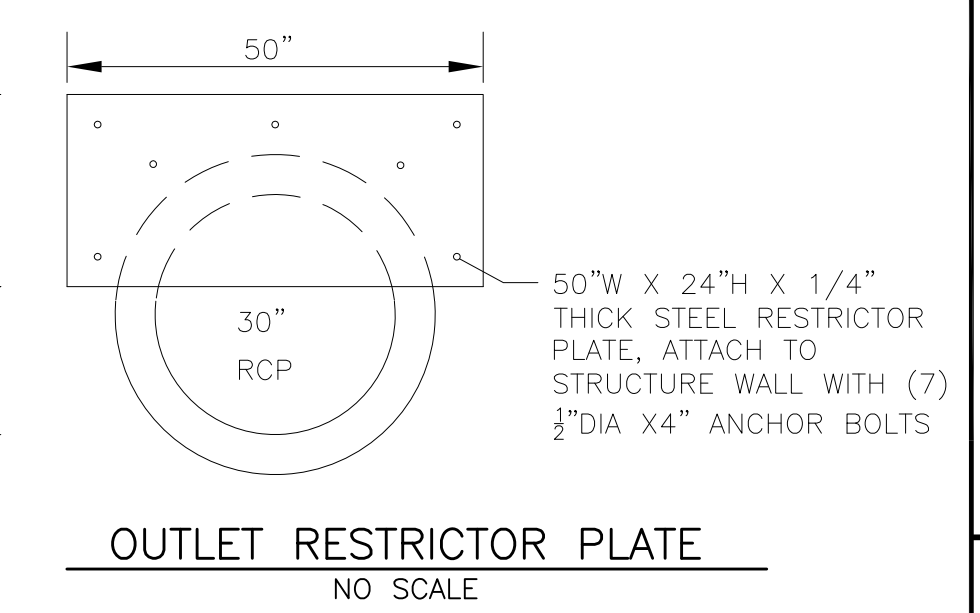
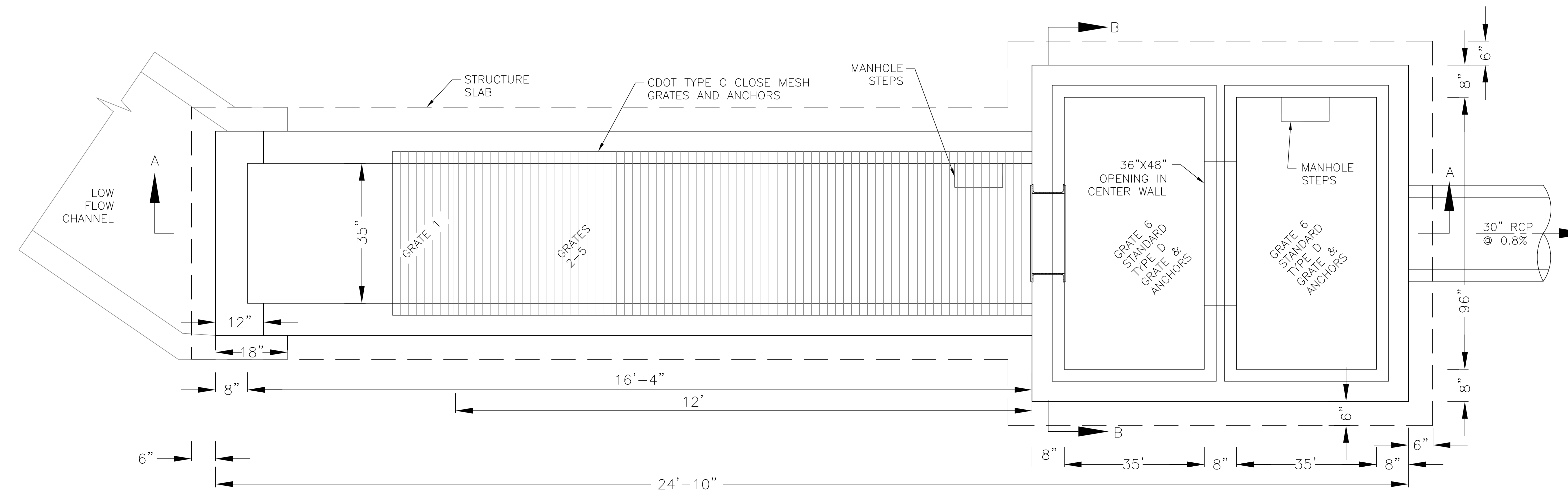
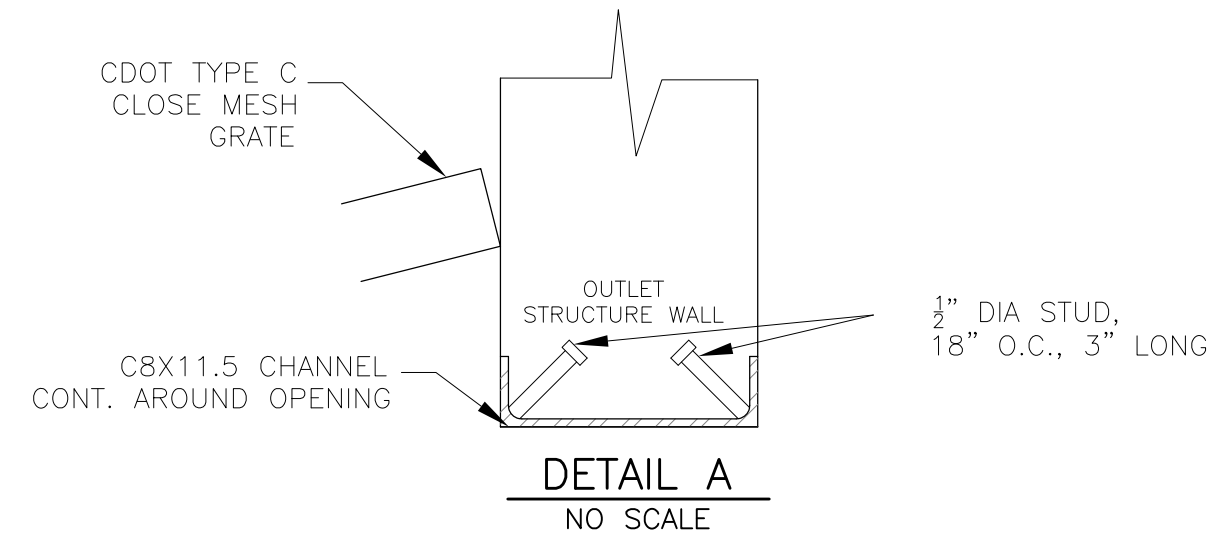


DATE: NOV 12, 2020

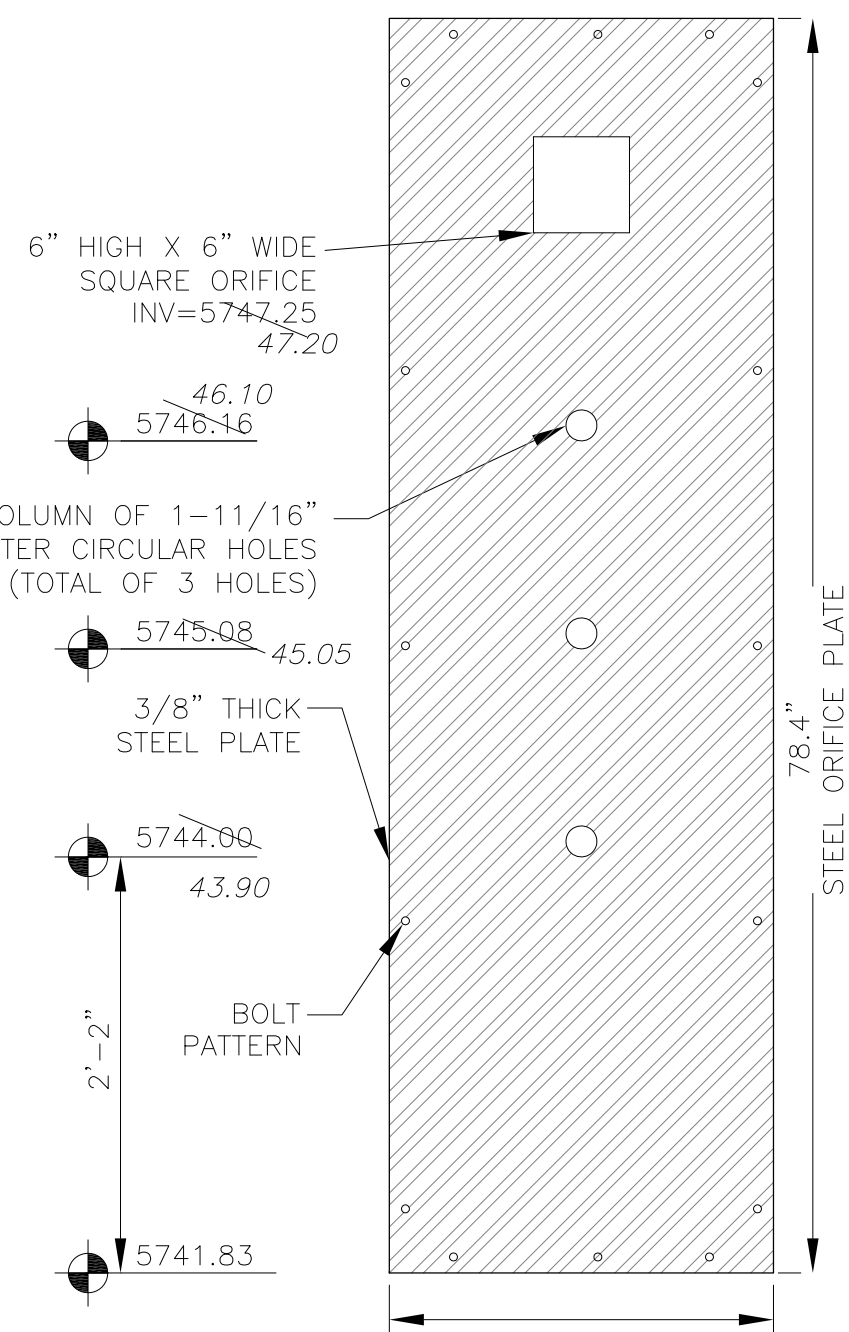
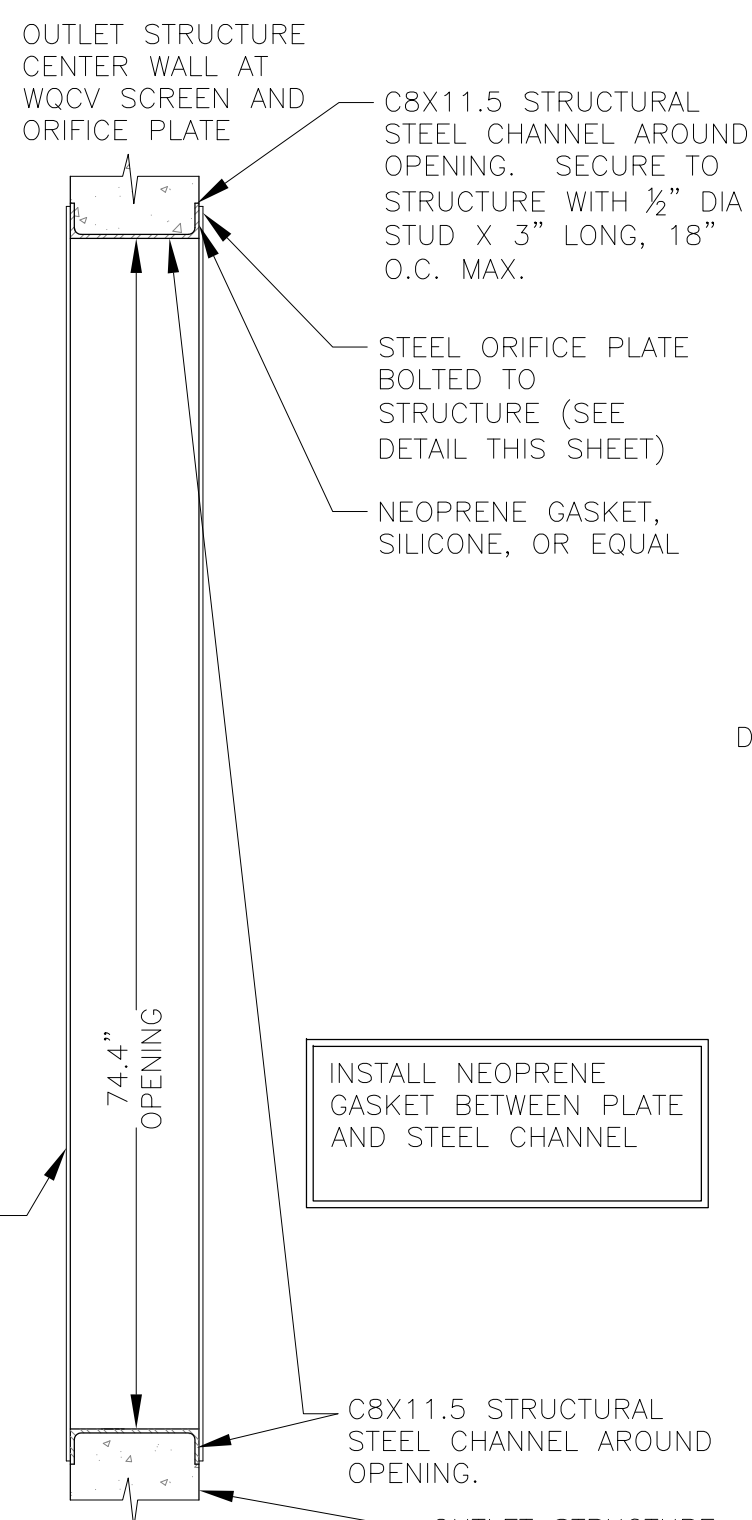
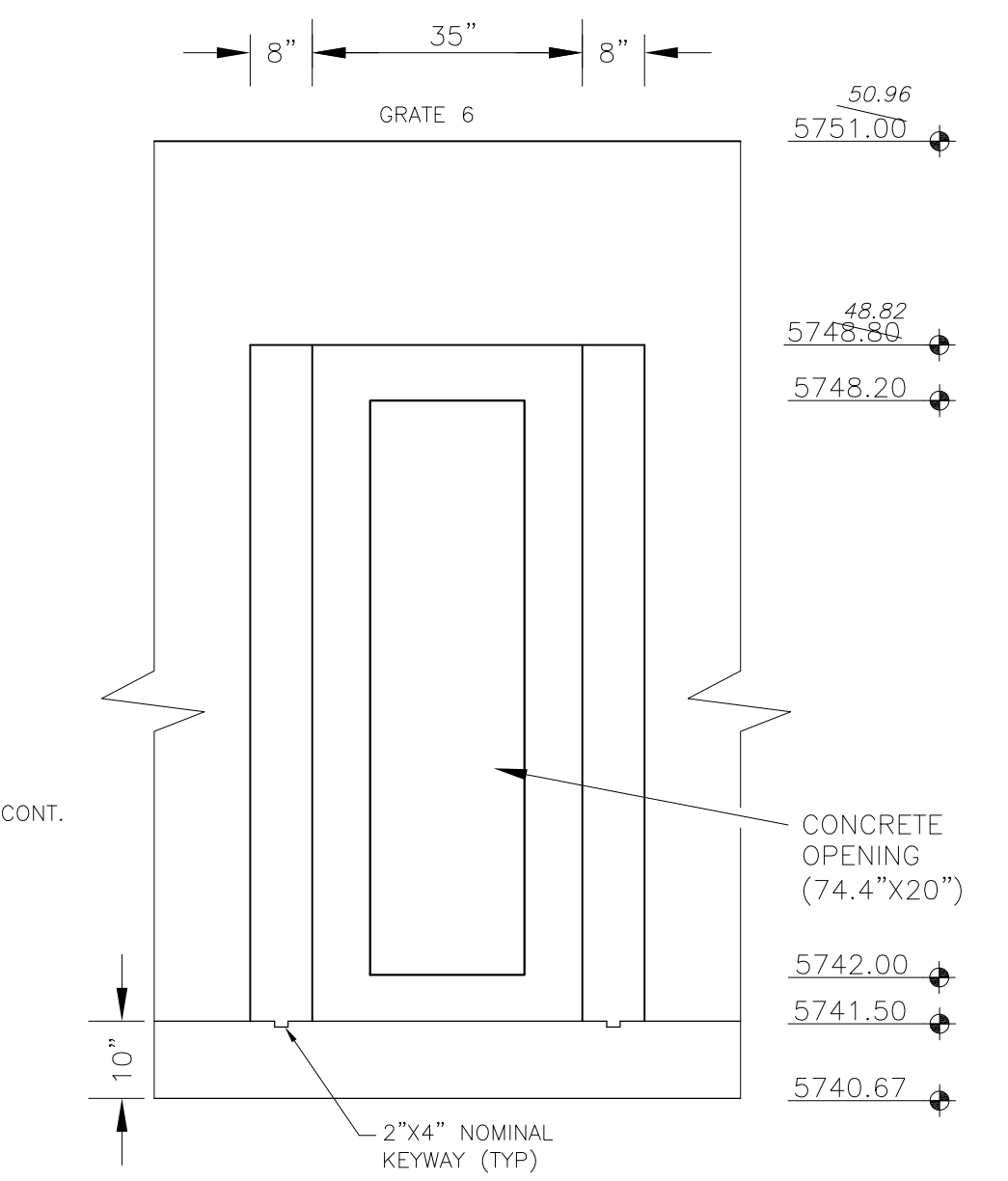
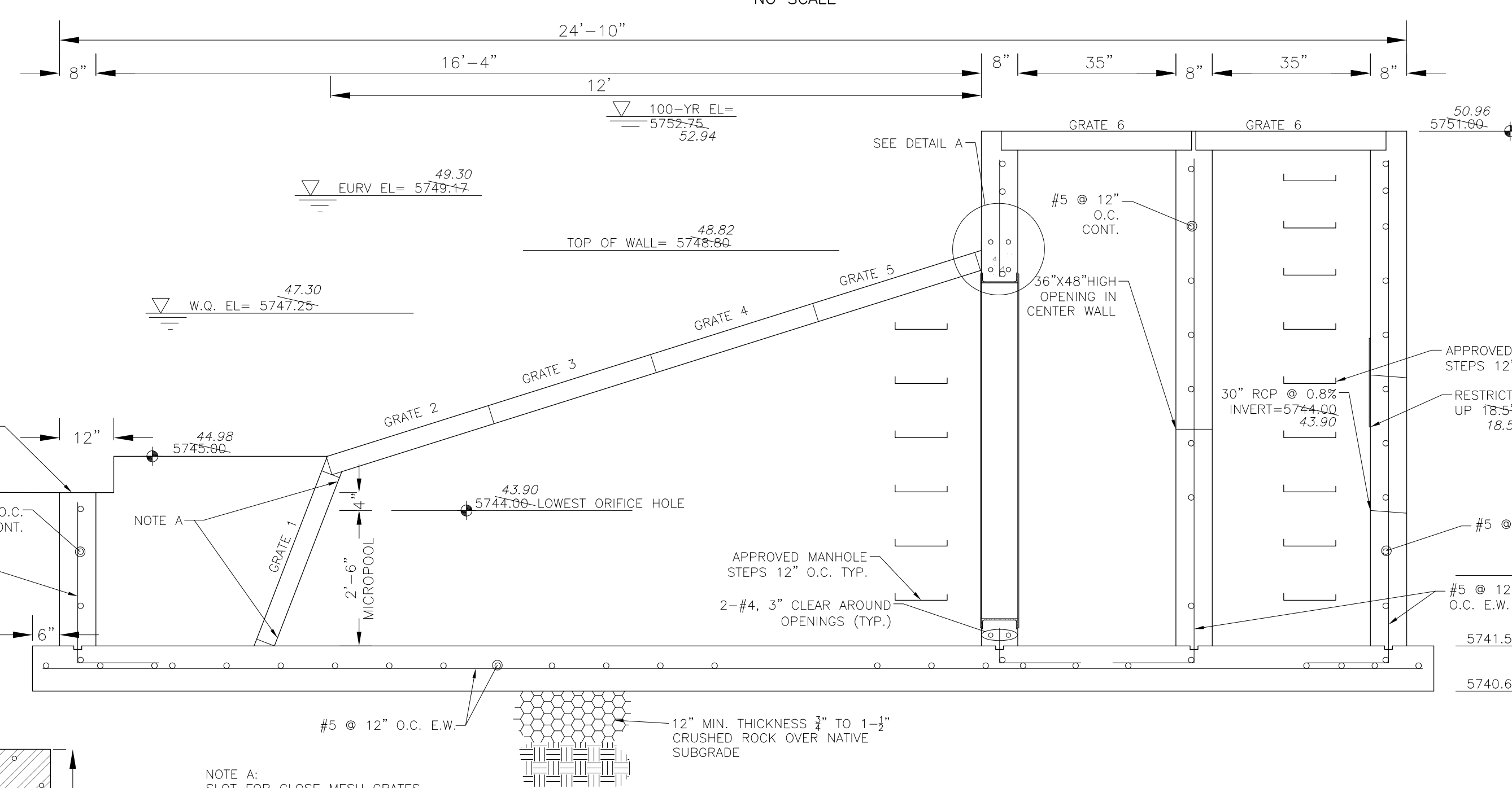
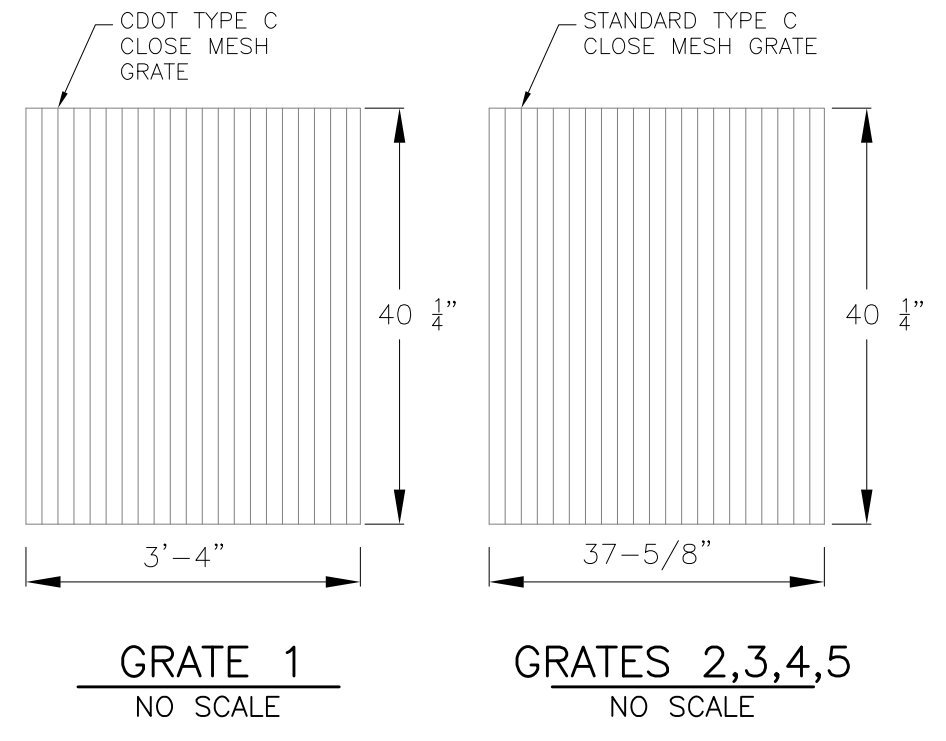
PROJECT NO. 100.061

SHEET NUMBER **C7.2**

TOTAL SHEETS: 58



NOTE:  
AFTER CONCRETE STRUCTURE HAS BEEN POURED  
ALL GRATE DIMENSIONS SHALL BE FIELD VERIFIED  
PRIOR TO GRATE CONSTRUCTION

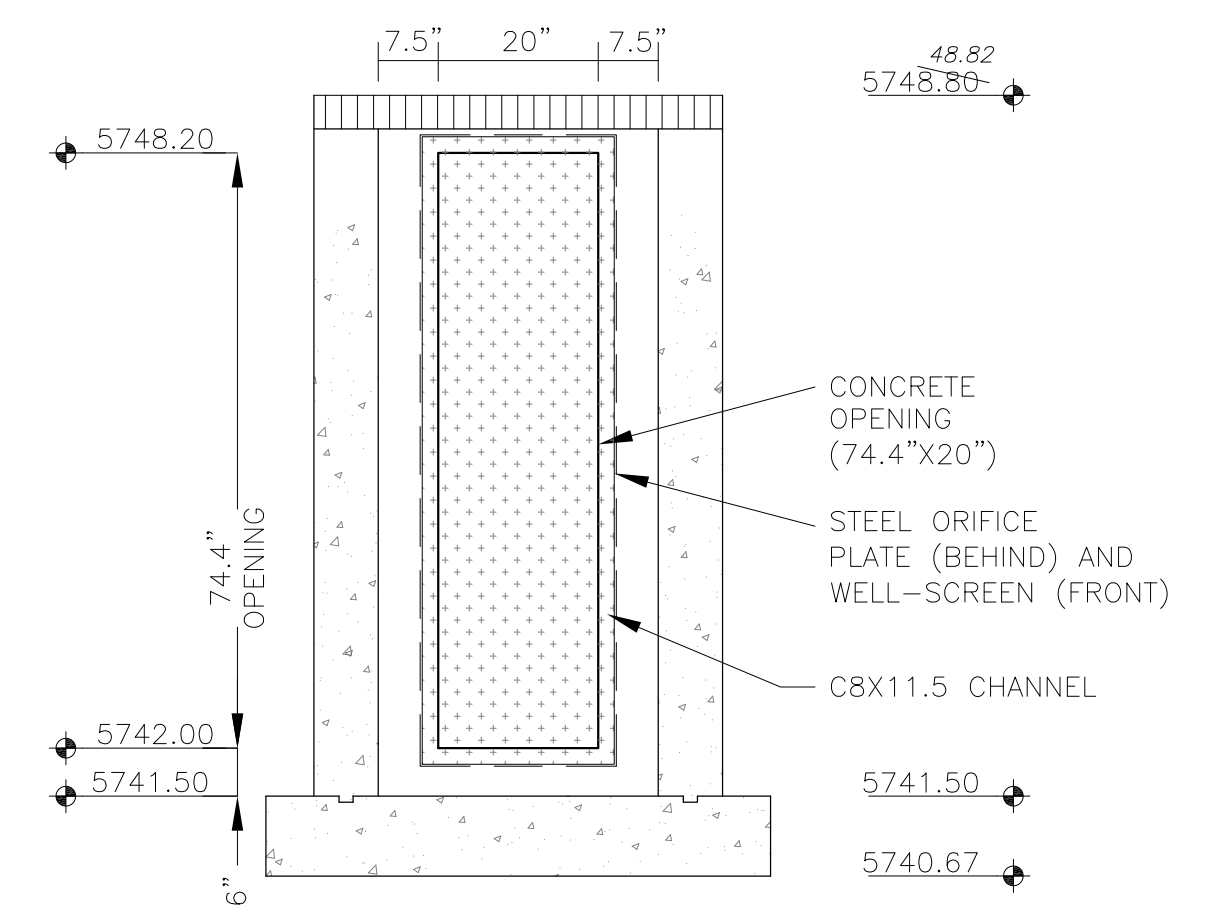


**OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:**

- PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL COMPONENTS OF THE OUTLET STRUCTURE.
  - GRADE 60 REINFORCING STEEL REQUIRED. SEE TABLE FOR THE MINIMUM LAP SPLICE LENGTH FOR REINFORCING BARS. ALL REINFORCING STEEL SHALL HAVE A TWO-INCH MINIMUM CLEARANCE FROM EDGE OF CONCRETE, UNLESS OTHERWISE NOTED.
- | BAR SIZE           | #4    | #5    | #6    |
|--------------------|-------|-------|-------|
| MIN. SPLICE LENGTH | 1'-3" | 1'-7" | 2'-0" |
- CONCRETE FOR THE OUTLET STRUCTURE AND FOREBAY SHALL BE CDOT CLASS D CONCRETE.
  - CONCRETE FOR DRAIN CHANNELS SHALL BE CDOT CLASS B CONCRETE
  - EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M-213. EXPANSION JOINT MATERIAL SHALL BE 1/2" THICK, SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE AND THE JOINT SHALL BE SEALED, REFER TO DETAILS.
  - ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 3/8" CHAMFER UNLESS OTHERWISE NOTED.
  - SUBGRADE TO BE 12" THICK CLEAN FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM M698 UNDER STRUCTURE.
  - REFER TO POND DETAILS FOR PRESEDIMENTATION/FOREBAY DESIGN.
  - ENGINEER SHALL BE NOTIFIED PRIOR TO BEGINNING CONSTRUCTION OF OUTLET STRUCTURE TO SCHEDULE OBSERVATION VISITS FOR STRUCTURES.

**WQCV WELL-SCREEN NOTES:**

- Well-Screen shall be stainless steel and attached by stainless steel bolts along edge of the mounting frame.
- WQCV Well Screen
  - Type of Screen: Stainless steel #93 Vee Wire (Johnson Vee Wire (tm) Stainless Steel Screen or equivalent with 60% open area)
  - Screen slot opening dimension: 0.139" (Screen #93 Vee Wire Slot Opening)
  - Type and Size of Support Rod: TE 0.074"x0.50"
  - Spacing of Support Rod (O.C.): 1.0 Inch
  - Total Screen Thickness: 0.655"
  - Carbon Steel Holding Frame Type: 3/4" x 1.0" angle



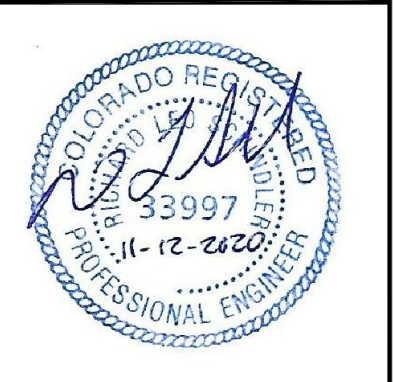
**CORE ENGINEERING GROUP**  
15004 1ST AVENUE S.  
PH: 719.570.5506  
PH: 719.570.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@cge1.com

DATE: \_\_\_\_\_  
DESCRIPTION: \_\_\_\_\_  
NO: \_\_\_\_\_  
PREPARED FOR: **LORSON, LLC**  
212 N. WAHSATCH AVE, SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
CONTACT: JEFF MARK

PROJECT: **THE HILLS COLLECTOR STREET CONSTRUCTION**  
FONTAINE BLVD. - GRAYLING DR  
LORSON BLVD - WALLEYE DR - LAMPREY DR  
COLORADO SPRINGS, COLORADO

DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

**POND C2.2  
FULL SPECTRUM  
OUTLET STRUCTURE DETAILS**



DATE: NOV 12, 2020

PROJECT NO. 100.061

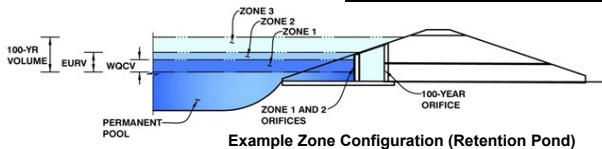
SHEET NUMBER **C9.13**  
TOTAL SHEETS: 58

**AS-BUILT**  
DATE: 09/30/2022

# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

**Project: The Hills at Lorson Ranch**  
**Basin ID: Pond C2.3-asbuilt**



**Example Zone Configuration (Retention Pond)**

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.25	0.294	Orifice Plate
Zone 2 (EURV)	3.34	0.589	Rectangular Orifice
Zone 3 (100+1/2WQCV)	4.62	0.834	Weir&Pipe (Restrict)
<b>Total (all zones)</b>		<b>1.717</b>	

**User Input: Orifice at Underdrain Outlet (typically used to drain WOCV in a Filtration BMP)**

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft <sup>2</sup>
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

**User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WOCV and/or EURV in a sedimentation BMP)**

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	6.806E-03	ft <sup>2</sup>
Depth at top of Zone using Orifice Plate =	2.25	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.98	sq. inches (diameter = 1-1/8 inches)	Elliptical Slot Area =	N/A	ft <sup>2</sup>

**User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)**

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.80	1.63					
Orifice Area (sq. inches)	0.98	0.98	0.98					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

**User Input: Vertical Orifice (Circular or Rectangular)**

	Zone 2 Rectangular	Not Selected		Zone 2 Rectangular	Not Selected
Invert of Vertical Orifice =	2.41	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.71
Depth at top of Zone using Vertical Orifice =	3.34	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.25
Vertical Orifice Height =	6.00	N/A	inches		
Vertical Orifice Width =	17.00	N/A	inches		

**User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))**

	Zone 3 Weir	Not Selected		Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	7.35	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H <sub>g</sub> =	7.35
Overflow Weir Front Edge Length =	8.00	N/A	feet	Overflow Weir Slope Length =	6.00
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	6.84
Horiz. Length of Weir Sides =	6.00	N/A	feet	Overflow Grate Open Area w/o Debris =	33.60
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	16.80
Debris Clogging % =	50%	N/A	%		

**User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)**

	Zone 3 Restrictor	Not Selected		Zone 3 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	0.15	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	4.91
Outlet Pipe Diameter =	30.00	N/A	inches	Outlet Orifice Centroid =	1.25
Restrictor Plate Height Above Pipe Invert =	30.00	N/A	inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14

**User Input: Emergency Spillway (Rectangular or Trapezoidal)**

Spillway Invert Stage =	9.20	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth =	1.17	feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	11.70	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.04	acres
Freeboard above Max Water Surface =	1.33	feet	Basin Volume at Top of Freeboard =	6.04	acre-ft

micropool = 0 = 5744.30

**Routed Hydrograph Results**

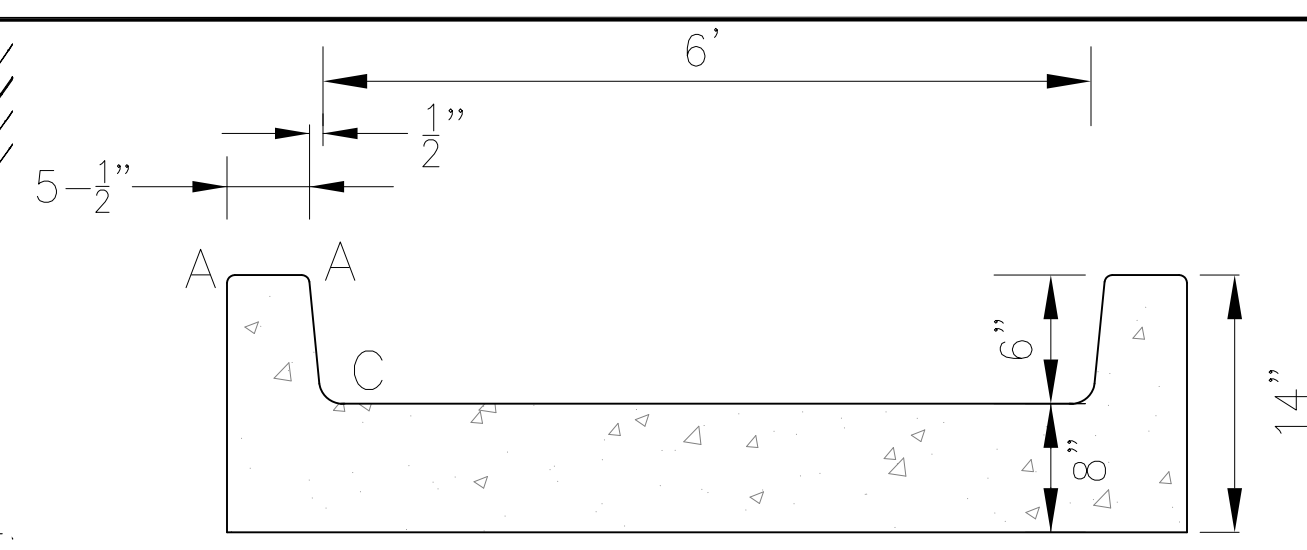
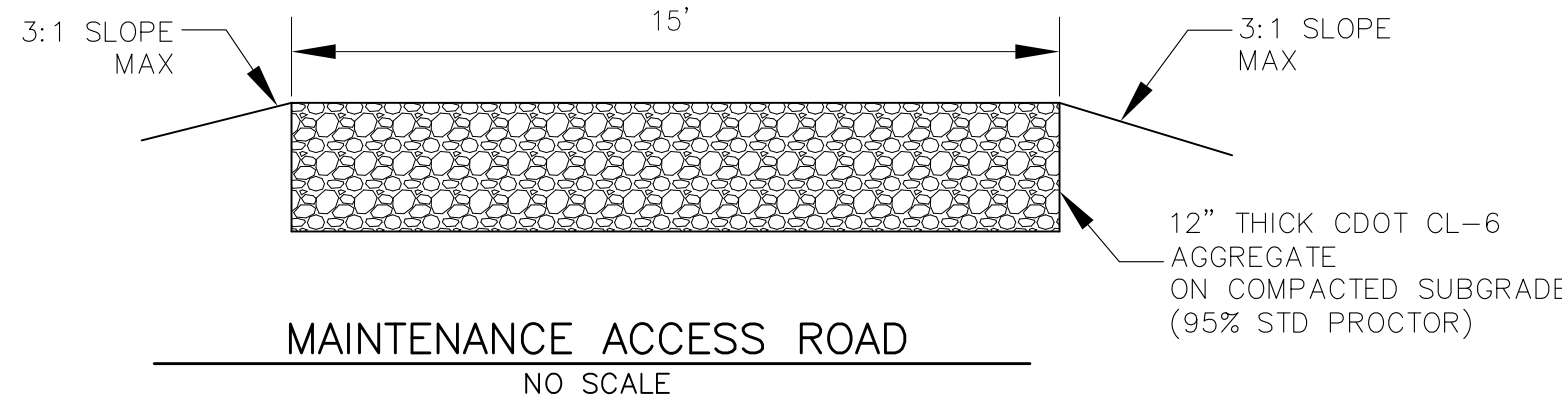
*The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF)*

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
One-Hour Rainfall Depth (in)	N/A	N/A	0.924	1.299	1.627	2.016	2.357	2.775
CUHP Runoff Volume (acre-ft)	0.294	0.883	2.831	4.148	5.891	8.181	10.069	12.414
User Override Inflow Hydrograph Volume (acre-ft)	N/A	N/A	2.2	5.0	7.2	11.8	14.6	18.5
CUHP Predevelopment Peak Q (cfs)	N/A	N/A	0.14	0.31	0.45	0.74	0.91	1.16
OPTIONAL Override Predevelopment Peak Q (cfs)	N/A	N/A	14.3	21.0	40.8	77.8	87.7	97.1
Predevelopment Unit Peak Flow, q (cfs/acre)	N/A	N/A	4.0	5.5	7.3	36.9	63.5	65.3
Peak Inflow Q (cfs)	N/A	N/A	N/A	1.1	1.0	3.1	4.3	3.5
Peak Outflow Q (cfs)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ratio Peak Outflow to Predevelopment Q	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Structure Controlling Flow	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Gate 1 (fps)	N/A	N/A	N/A	N/A	N/A	0.9	1.6	1.7
Max Velocity through Gate 2 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours)	45	56	51	46	41	33	27	20
Time to Drain 99% of Inflow Volume (hours)	47	61	62	61	60	56	52	49
Maximum Ponding Depth (ft)	2.25	3.34	3.95	5.07	6.96	7.96	8.33	8.73
Area at Maximum Ponding Depth (acres)	0.40	0.61	0.65	0.71	0.83	0.90	0.93	0.95
Maximum Volume Stored (acre-ft)	0.296	0.886	1.266	2.029	3.493	4.348	4.686	5.061



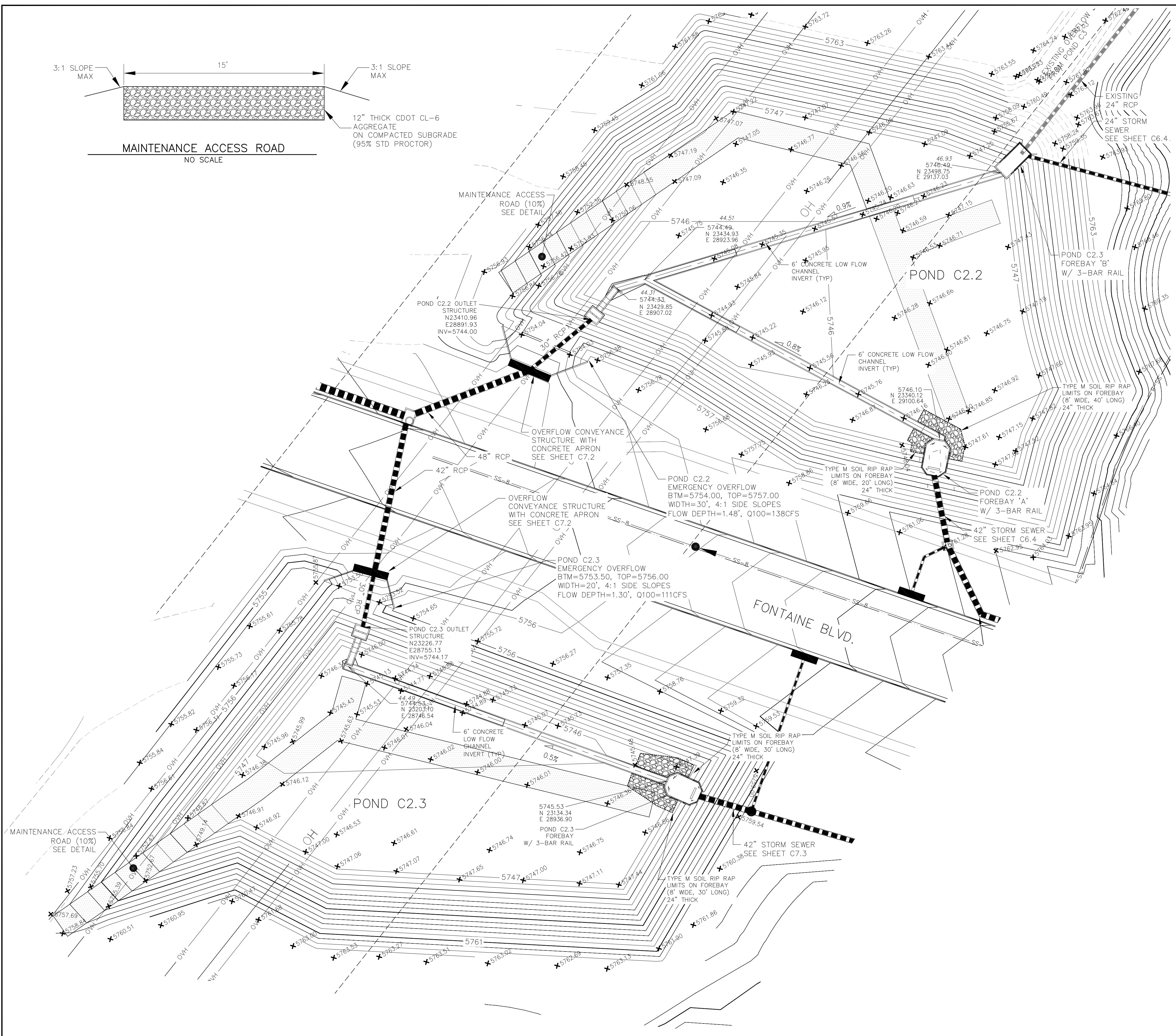




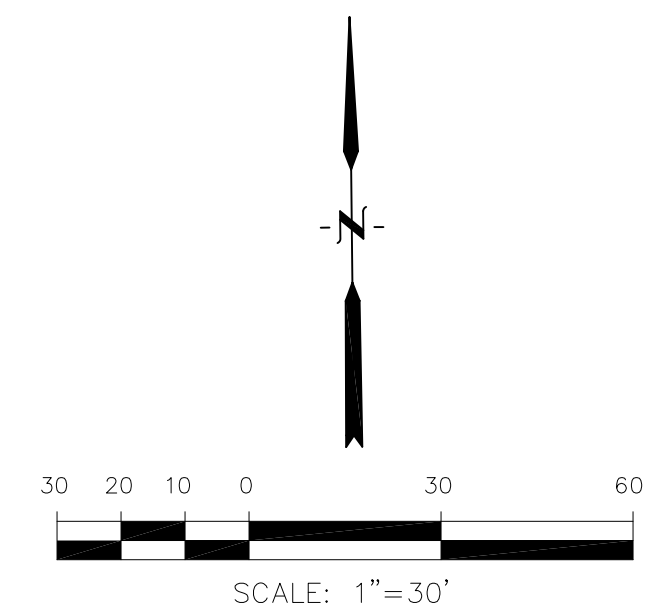


LENGTH FOR RADII

A	= 1/2"
C	= 1-1/2"



**AS-BUILT**  
DATE: 09/30/2022



**CORE ENGINEERING GROUP**  
19004 1ST AVENUE S.  
PHOENIX, AZ 85006  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@cgei.com

PREPARED FOR: **LORSON, LLC**  
212 N. WAHSATCH AVE., SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
(719) 635-3200  
CONTACT: JEFF MARK

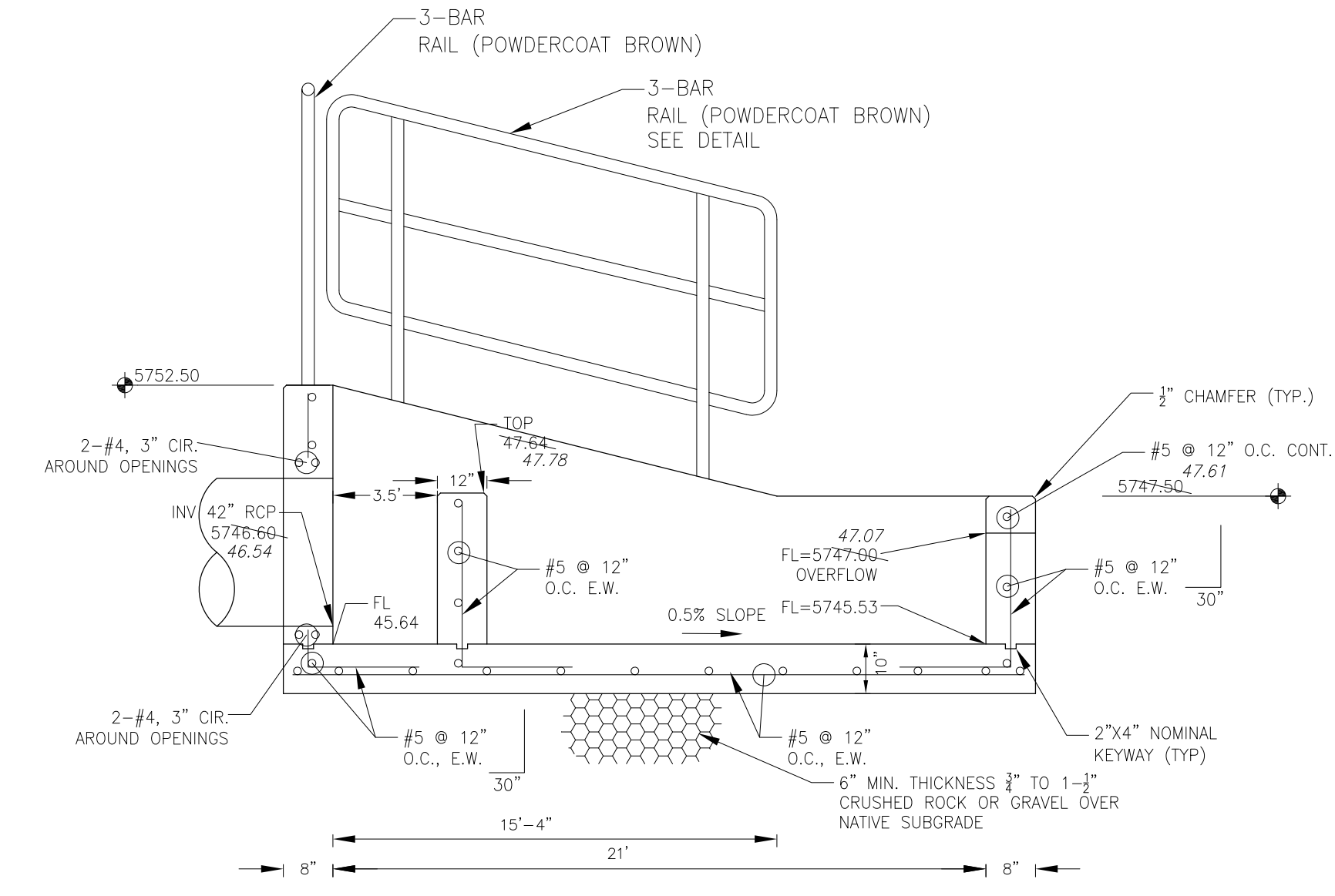
PROJECT: **THE HILLS COLLECTOR STREET CONSTRUCTION**  
FONTAINE BLVD. - GRAYLING DR  
LORSON BLVD. - WALLEYE DR - LAMPREY DR  
COLORADO SPRINGS, COLORADO

DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

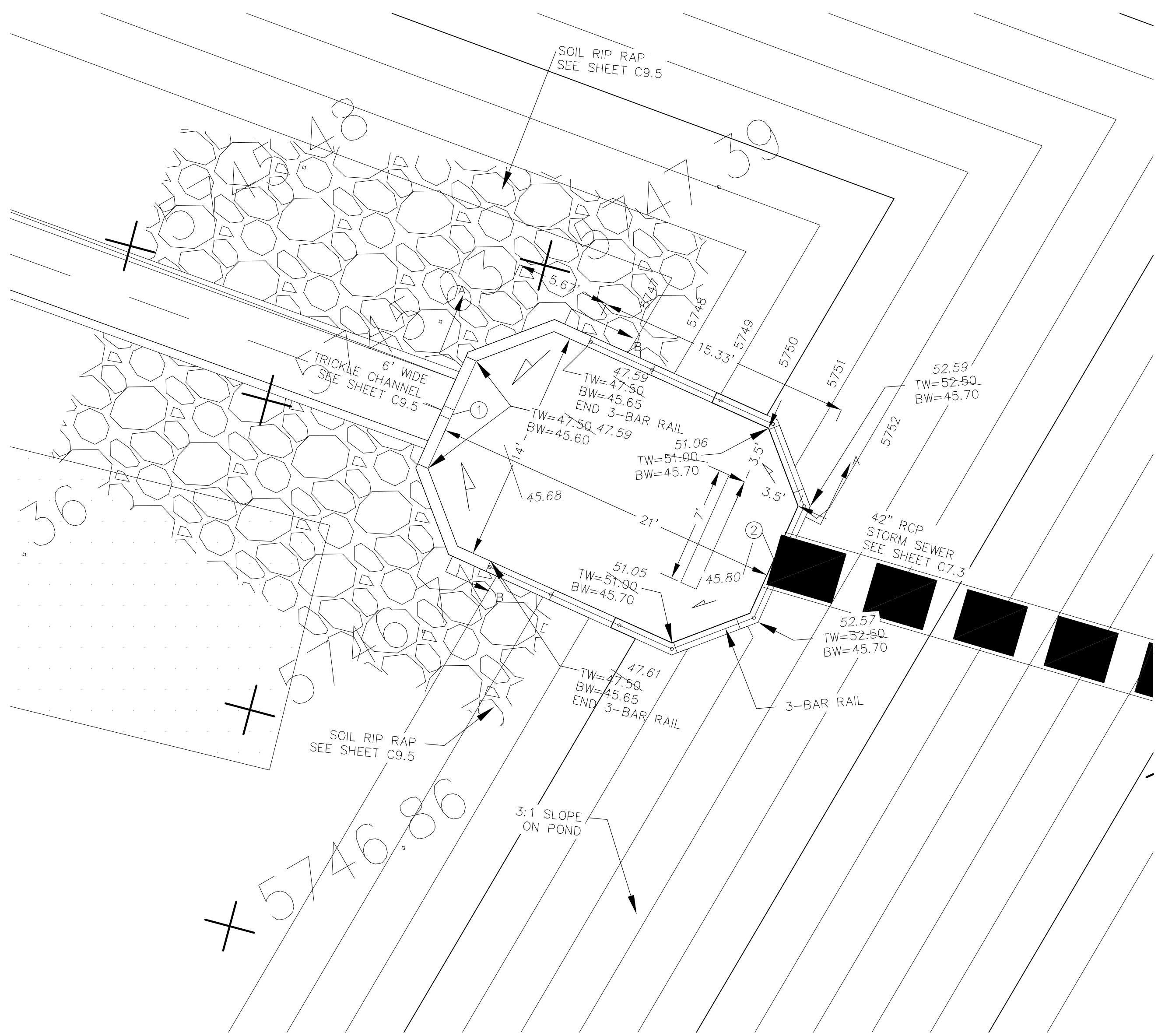
**POND C2.2 & C2.3 FOREBAY, LOW FLOW CHANNEL AND OUTLET STRUCTURE LAYOUT**



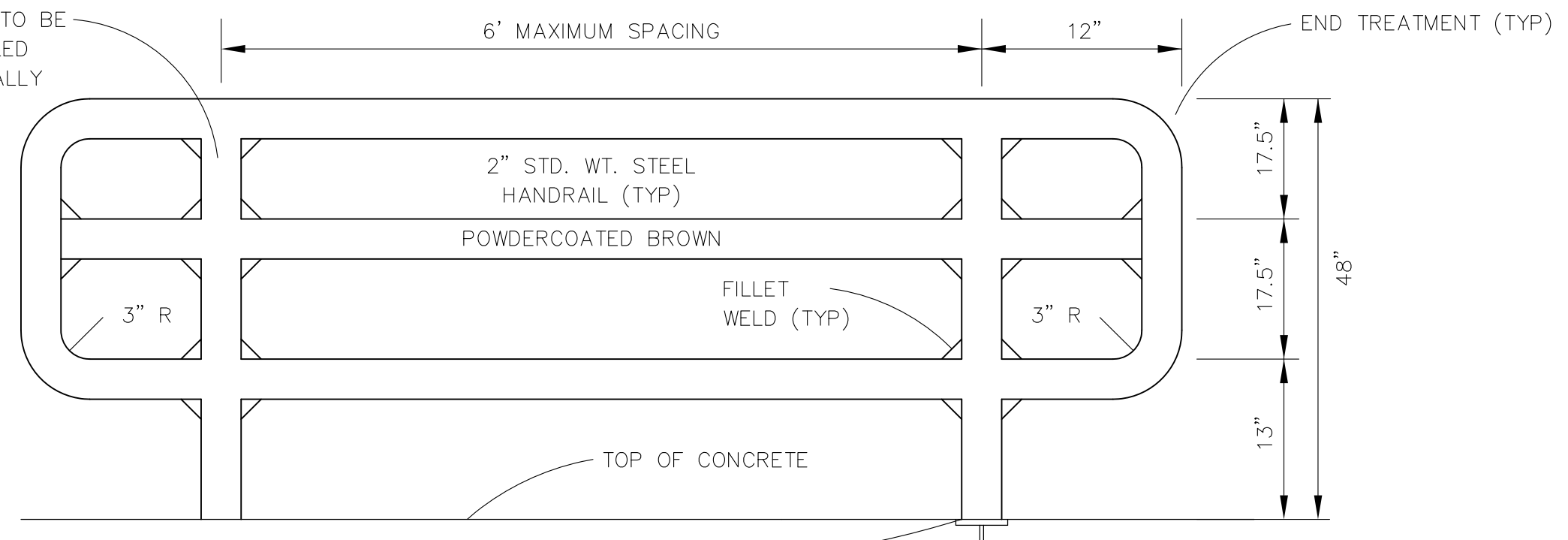
DATE: NOV 12, 2020  
PROJECT NO. 100.061  
SHEET NUMBER **C9.5**  
TOTAL SHEETS: 58



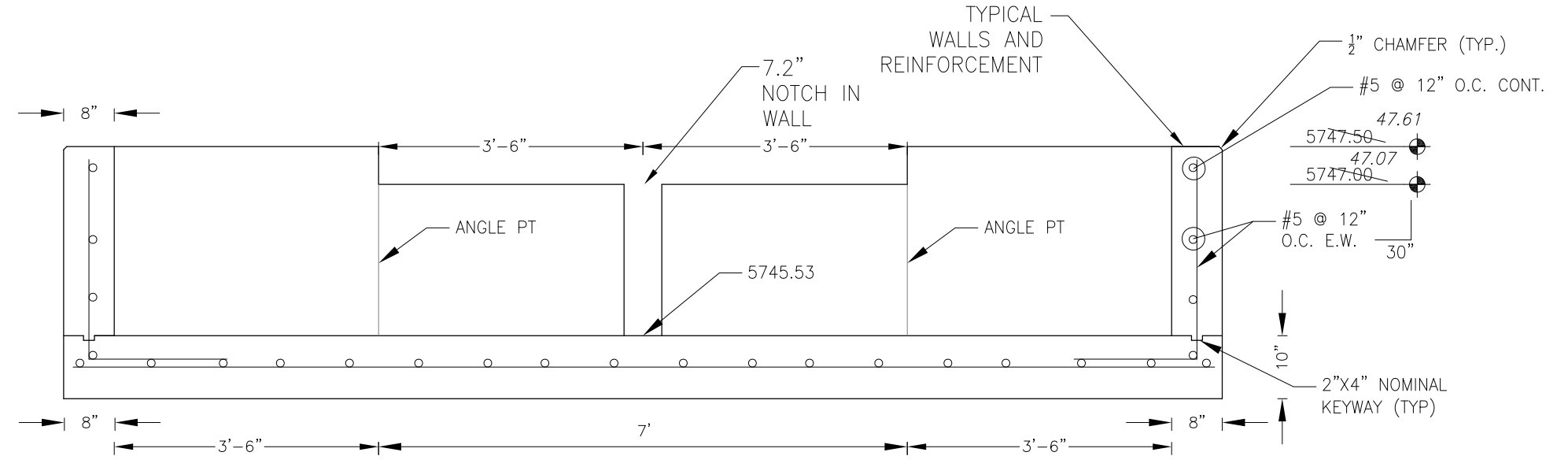
**FOREBAY SECTION A-A**  
NO SCALE



**POND C2.3 - FOREBAY LAYOUT**  
SCALE: 1"=5'



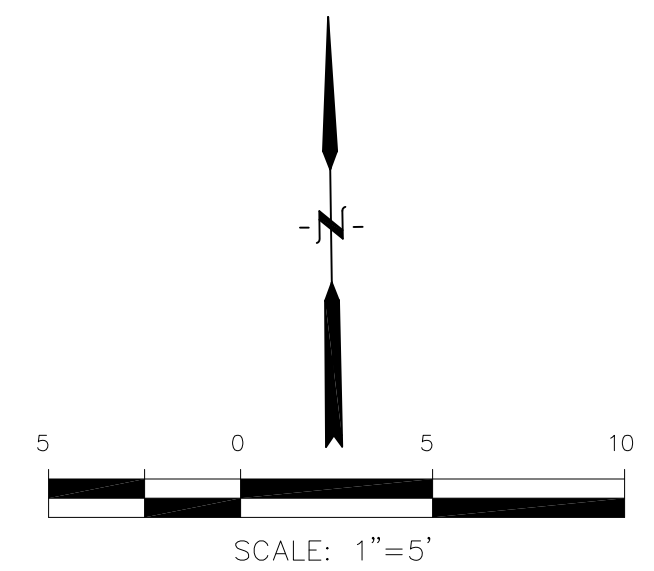
**3-BAR RAIL DETAIL**  
NO SCALE



**FOREBAY SECTION B-B**  
NO SCALE

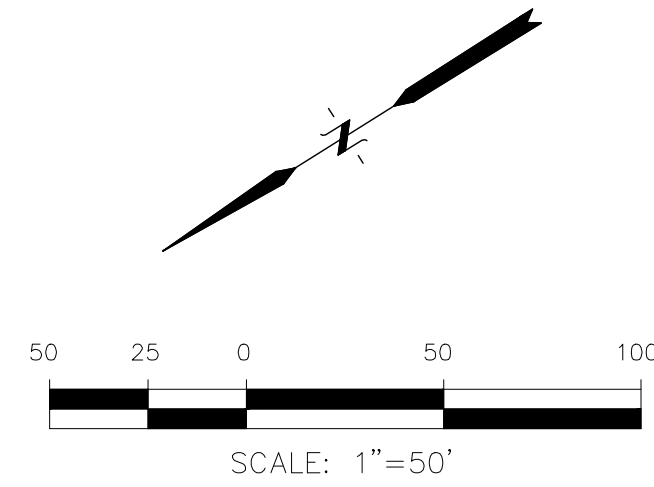
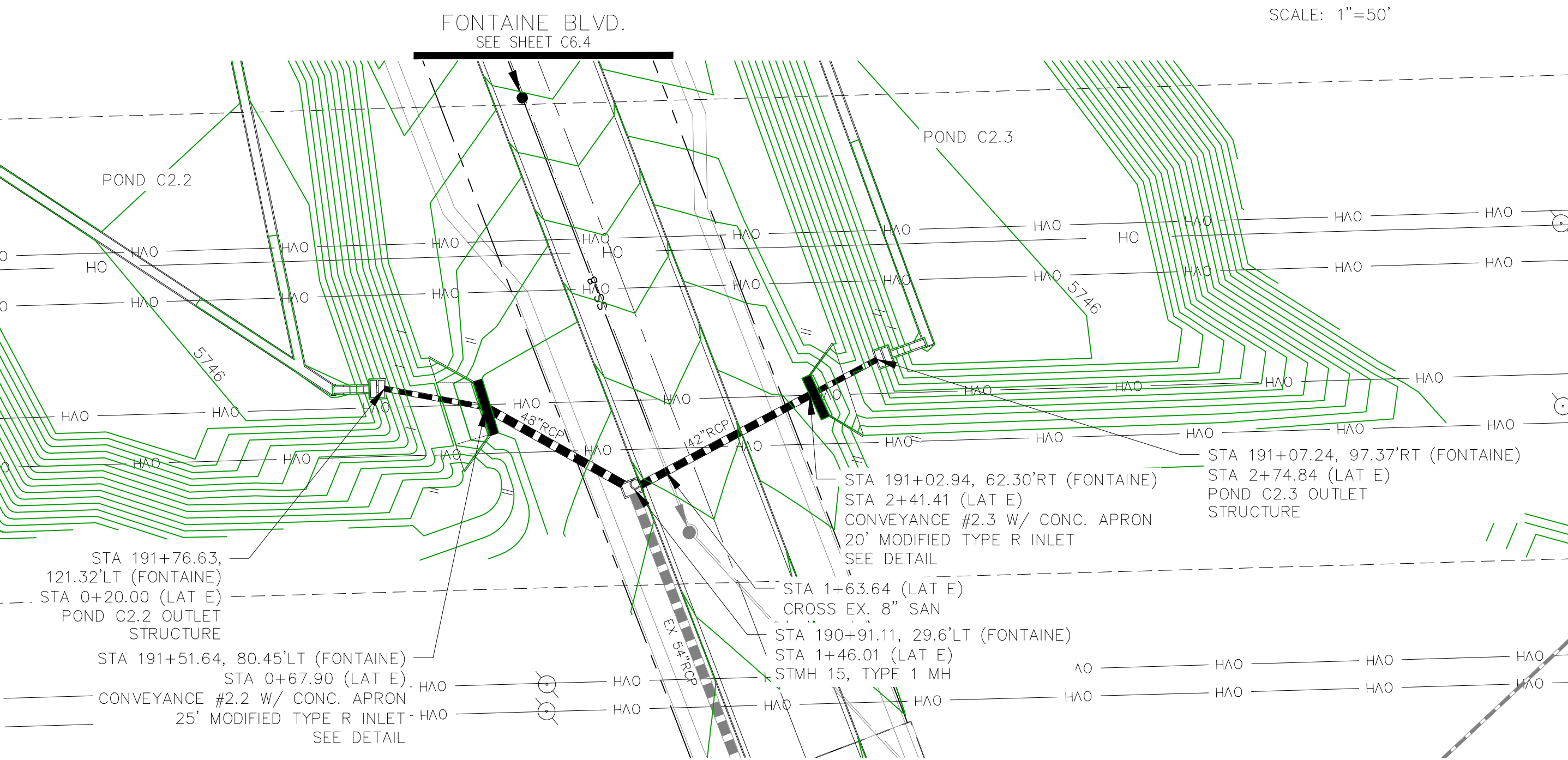
NOTE: ALL CONCRETE FOR FOREBAY SHALL BE CDOT TYPE D

POINT TABLE (FOREBAY)				
NUMBER	NORTHING	EASTING	ELEVATION	NOTES
1	23134.06	28937.51	5745.53	FOREBAY BOTTOM
2	23125.44	28956.66	5745.64	FOREBAY BOTTOM, INV 42"=5746.50

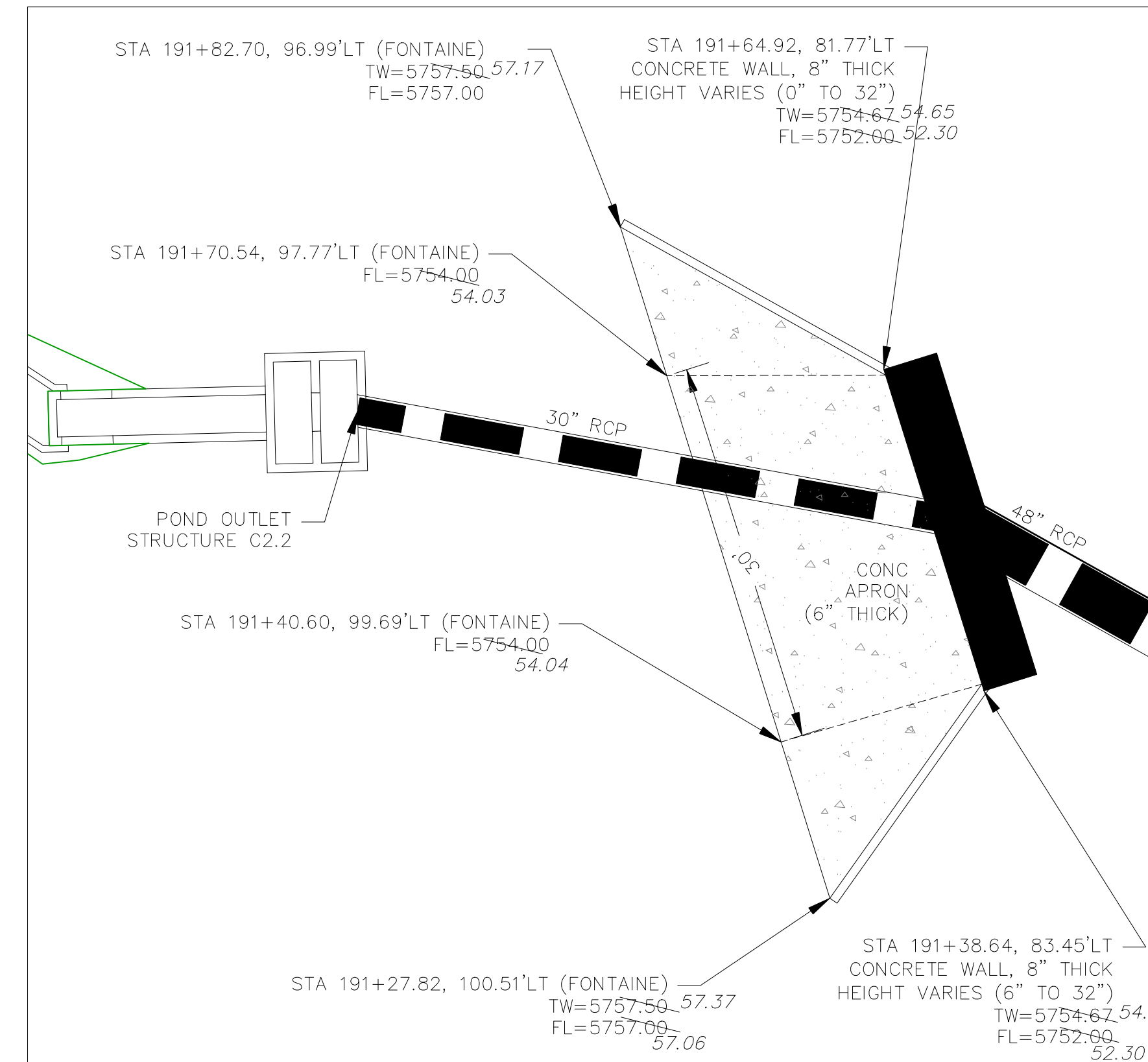
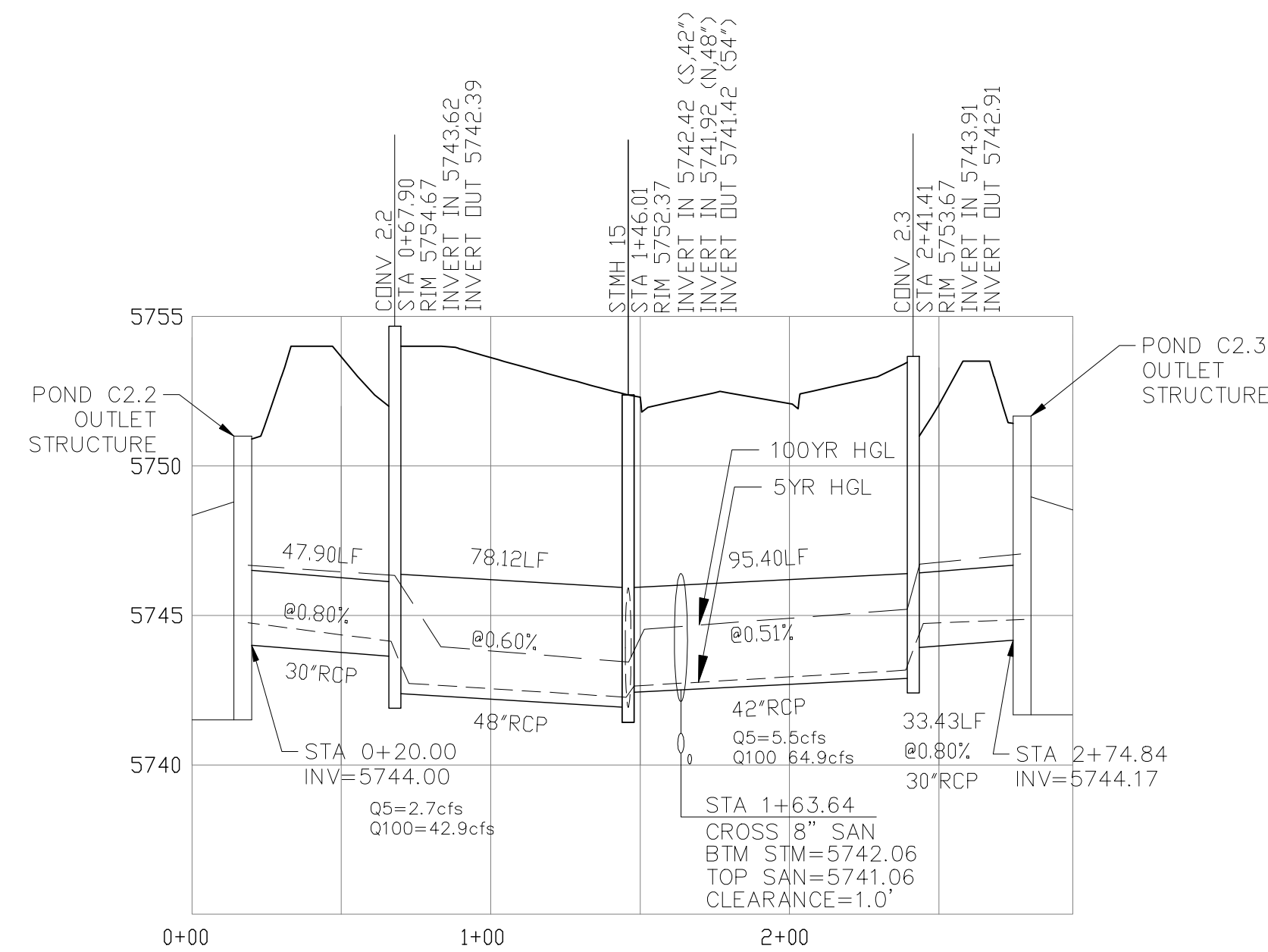


- NOTES**
1. ALL SPOT ELEVATIONS ARE FLOW LINE UNLESS OTHERWISE NOTED.
  2. SEE EARLY GRADING PLAN FOR GRADING INFORMATION.
  3. ALL STORM SEWER SHALL BE CLASS III RCP.
  4. ALL MHS SHALL BE TYPE 1 UNLESS OTHERWISE NOTED.

- 1 CURVE DATA ID
- 2 PEDESTRIAN RAMP, SEE SHEET C10.1
- 3 CURB/GUTTER FLOW LINE POINTS

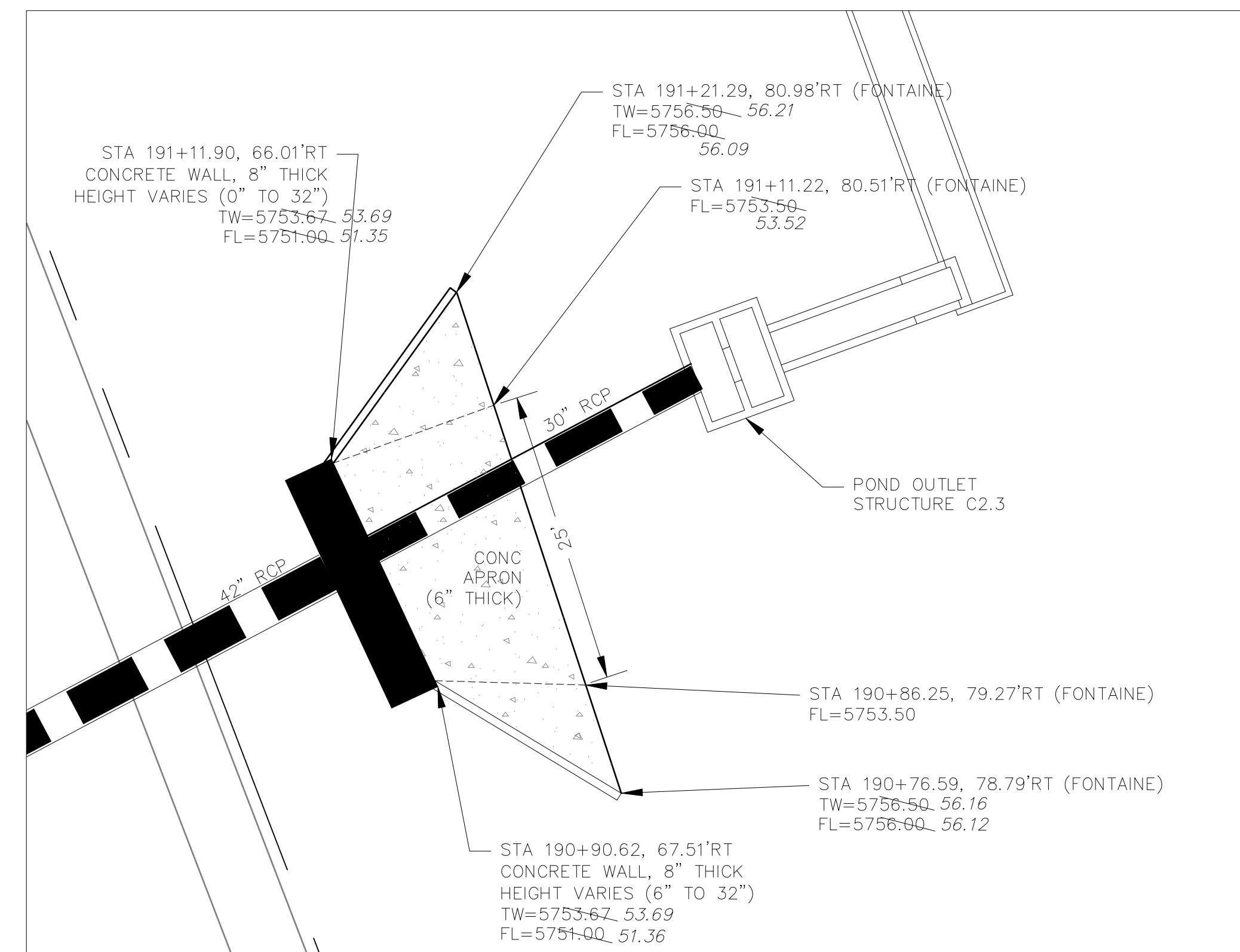


**STORM LATERAL 'E'**



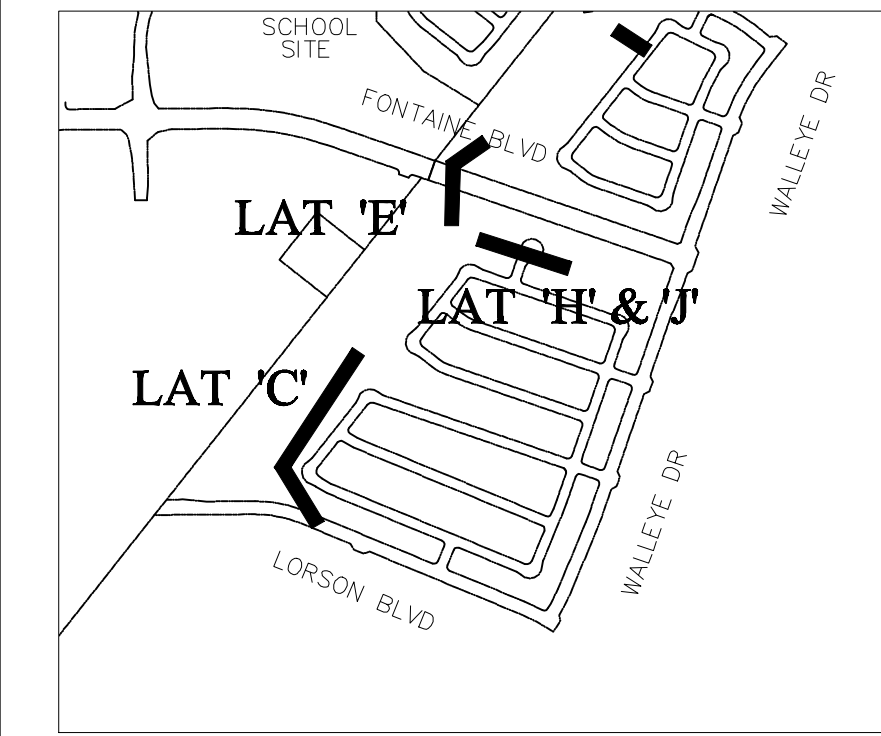
**CONVEYANCE STRUCTURE #2.2**

SCALE: 1"=10'



**CONVEYANCE STRUCTURE #2.3**

SCALE: 1"=10'



**KEY MAP**

**CONVEYANCE STRUCTURE #2.2 NOTES:**

1. 25' CDOT TYPE R INLET WITH MODIFIED THROAT OPENING
2. THROAT OPENING = 24"
3. EXTEND 1.25" GALVANIZED STEEL ROD SUPPORTS (TYPE R INLET) TO ACCOMMODATE 24" THROAT OPENING
4. CONCRETE APRON TO BE REINFORCED WITH NO. 4 REBAR, 24" O.C. BOTH WAYS. REBAR TO EXTEND INTO CONCRETE WALL W/ NO. 4 "L" BARS, 18" O.C.
5. CONCRETE WALLS SHALL HAVE A MINIMUM OF TWO HORIZONTAL NO. 4 BARS
6. 24" THROAT OPENING TO INCLUDE SAFETY GRATE.

**CONVEYANCE STRUCTURE #2.3 NOTES:**

1. 20' CDOT TYPE R INLET WITH MODIFIED THROAT OPENING
2. THROAT OPENING = 24"
3. EXTEND 1.25" GALVANIZED STEEL ROD SUPPORTS (TYPE R INLET) TO ACCOMMODATE 24" THROAT OPENING
4. CONCRETE APRON TO BE REINFORCED WITH NO. 4 REBAR, 24" O.C. BOTH WAYS. REBAR TO EXTEND INTO CONCRETE WALL W/ NO. 4 "L" BARS.
5. CONCRETE WALLS SHALL HAVE A MINIMUM OF TWO HORIZONTAL NO. 4 BARS
6. 24" THROAT OPENING TO INCLUDE SAFETY GRATE.

**AS-BUILT**  
DATE: 09/30/2022

**CORE ENGINEERING GROUP**  
15004 1ST AVENUE S.  
DENVER, CO 80202  
PHONE: 719.576.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@cegi.com

DATE: JAN 12, 2021

DESCRIPTION: RAISE SITE 1' EAST OF POWERLINES

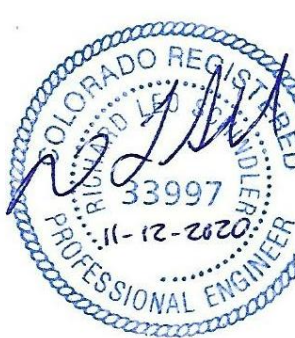
NO. 1

PROJECT: THE HILLS COLLECTOR STREET CONSTRUCTION  
212 N. WAHSATCH AVE SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
LORSON BLVD - GRAYLING DR  
LORSON BLVD - WALLEVE DR - LAMPREY DR  
COLORADO SPRINGS, COLORADO

PREPARED FOR: LORSON, LLC  
CONTACT: JEFF MARK

DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

**STREET & STORM SEWER PLAN/PROFILE**  
**STORM LATERAL 'E'**  
**CONVEYANCE #2.2 & #2.3**

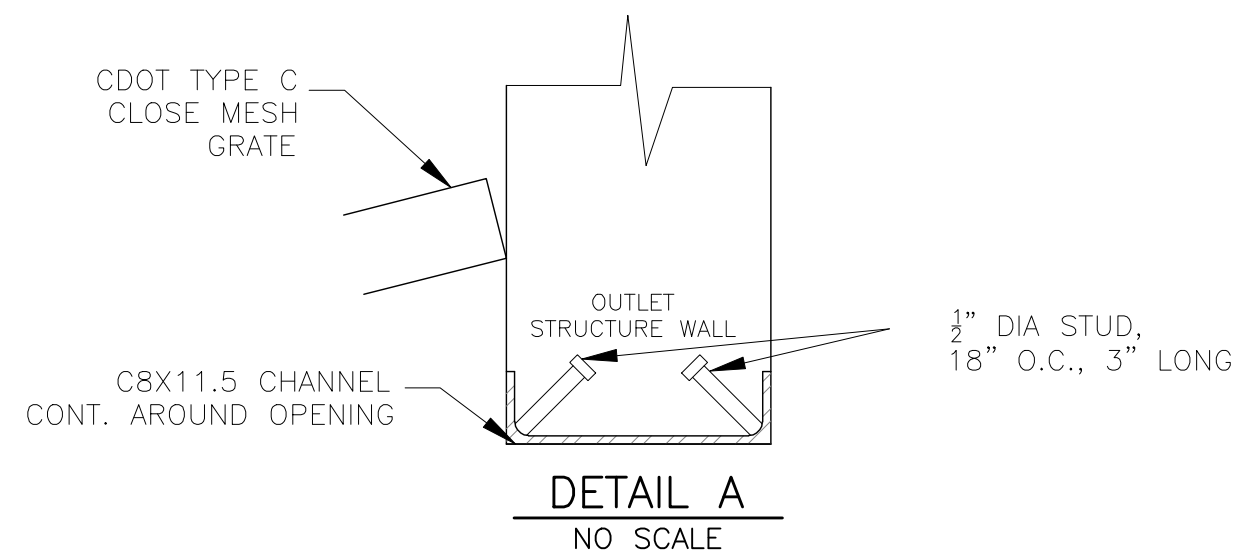


DATE: NOV 12, 2020

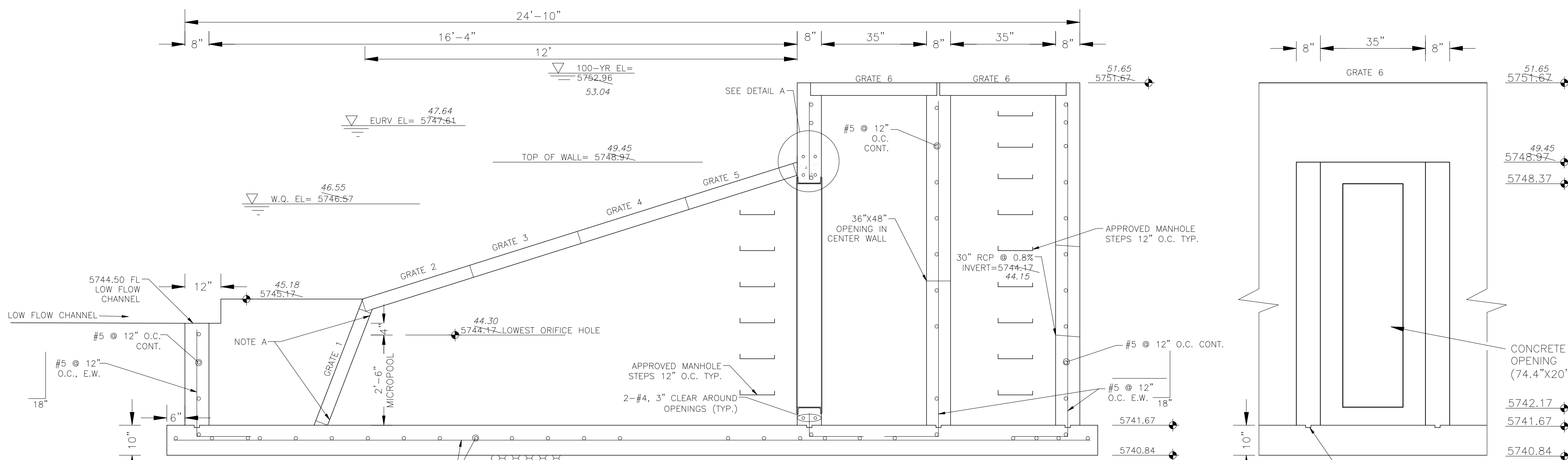
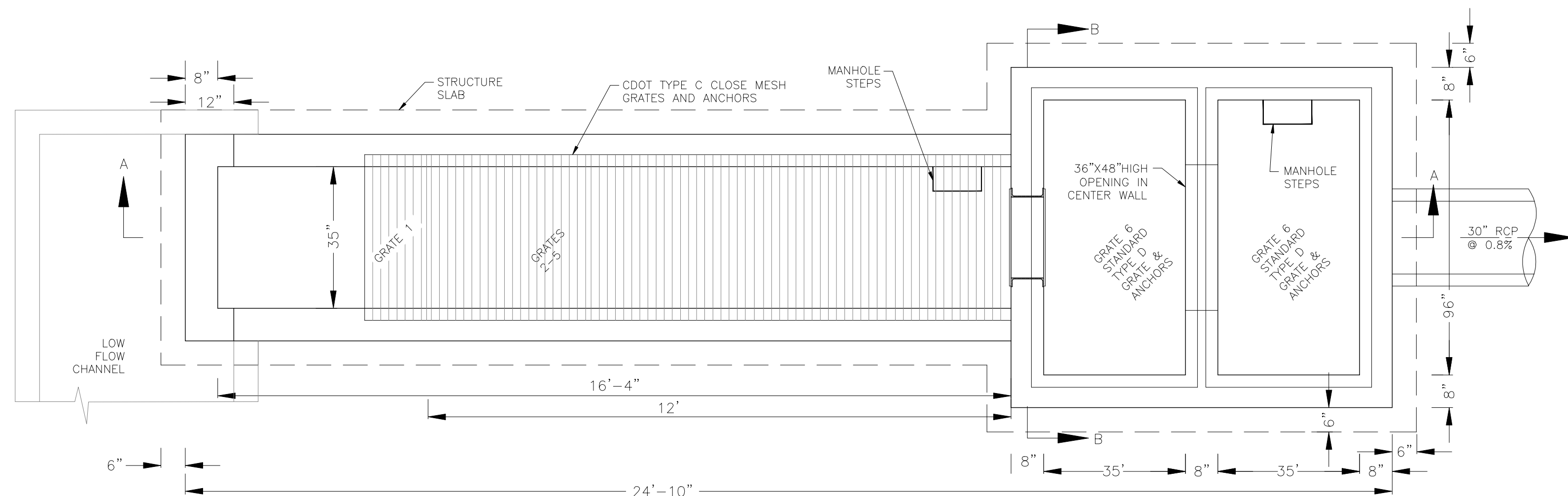
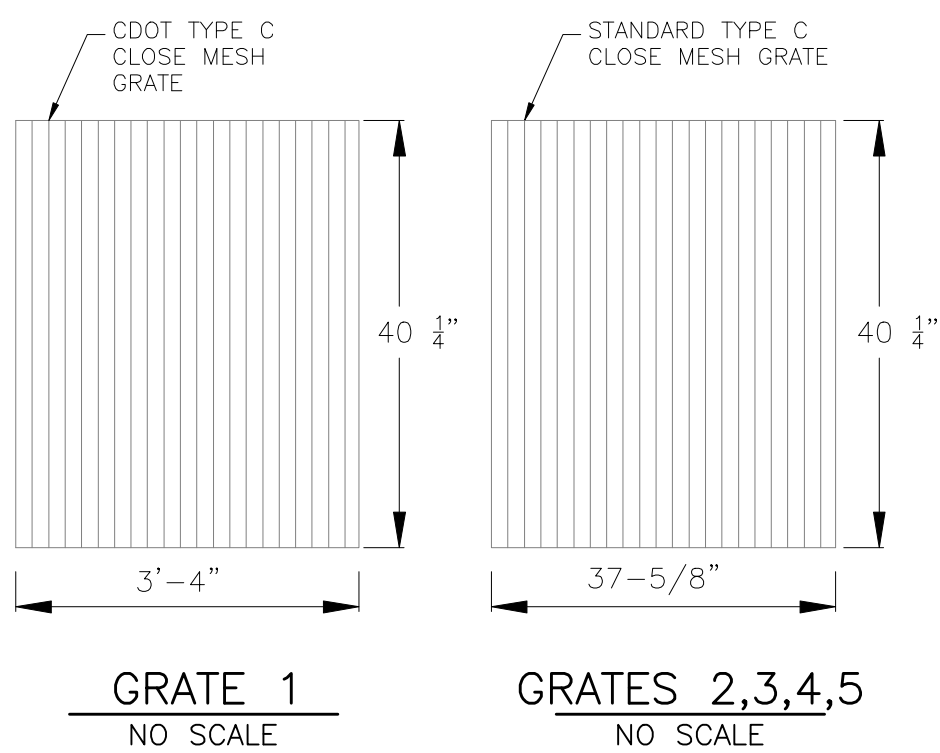
PROJECT NO. 100.061

SHEET NUMBER **C7.2**

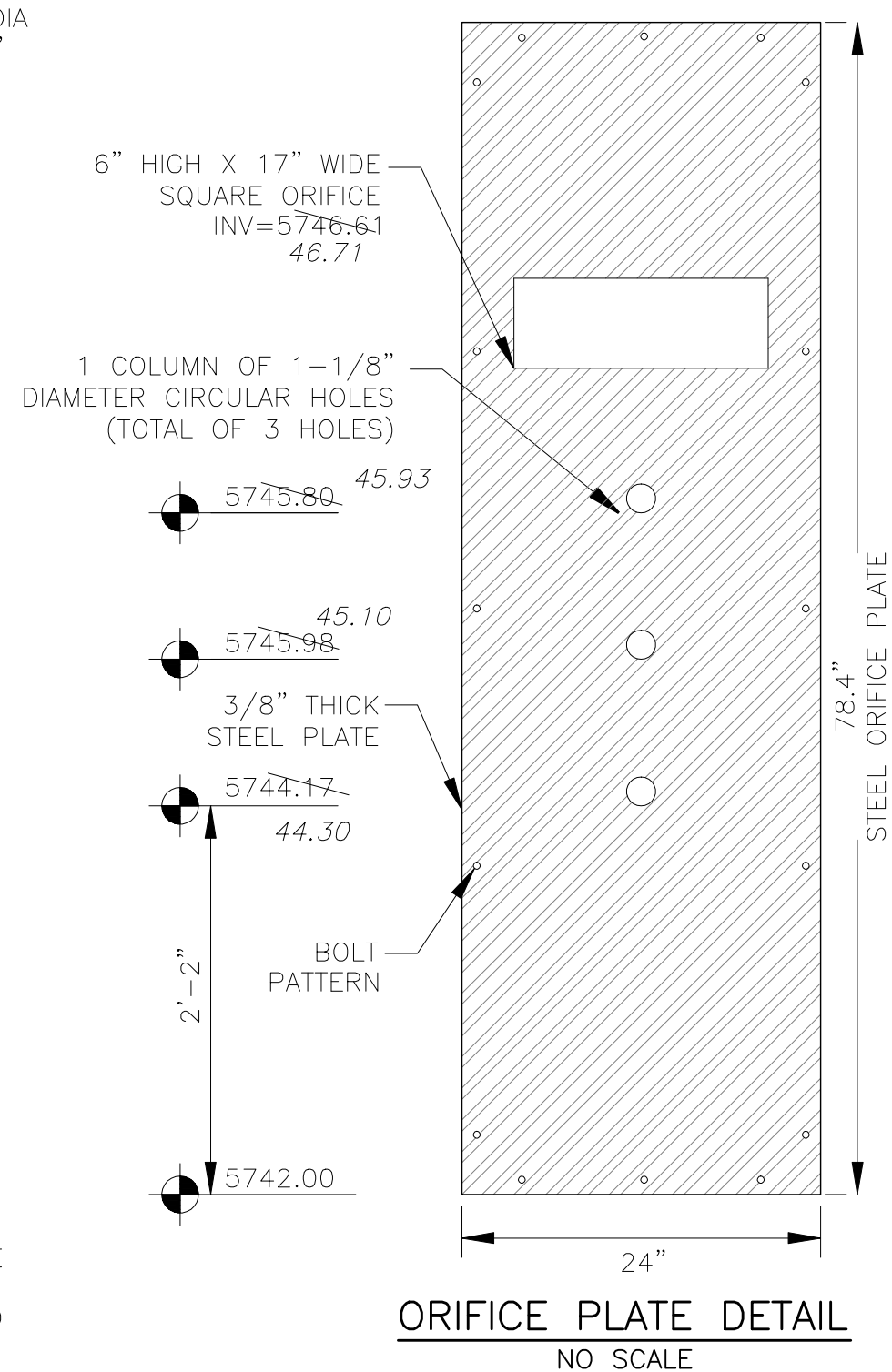
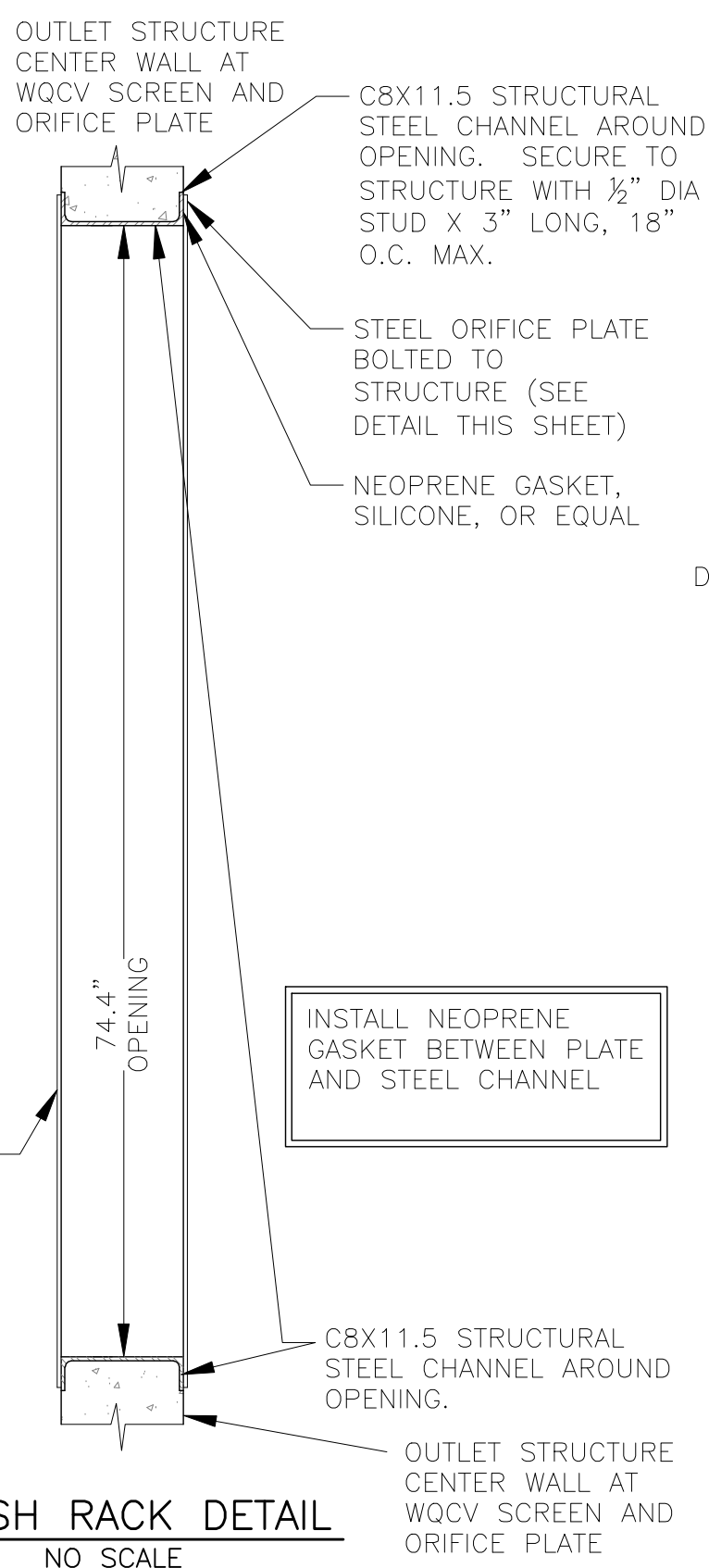
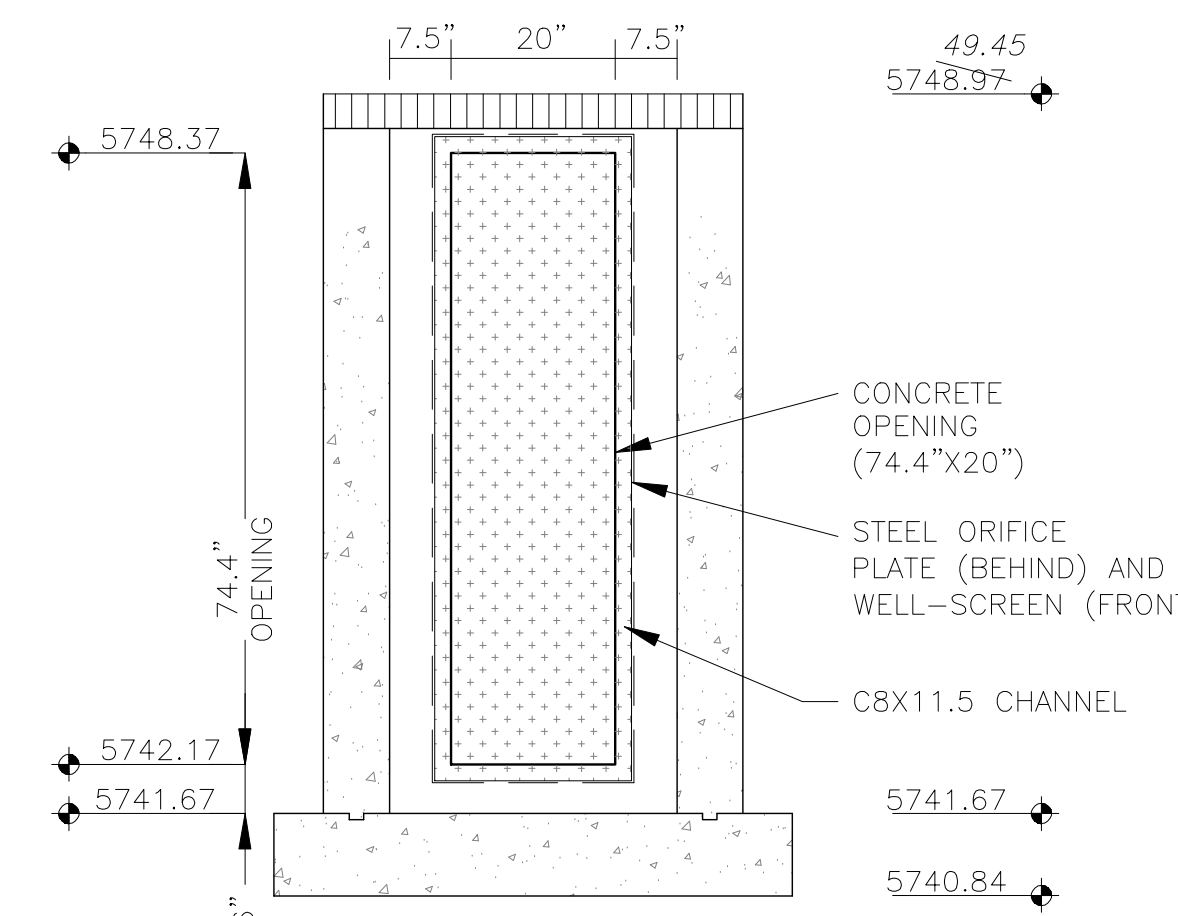
TOTAL SHEETS: 58



NOTE:  
AFTER CONCRETE STRUCTURE HAS BEEN POURED  
ALL GRATE DIMENSIONS SHALL BE FIELD VERIFIED  
PRIOR TO GRATE CONSTRUCTION



OUTLET STRUCTURE DETAIL - SECTION B-B  
NO SCALE



OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:

- PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL COMPONENTS OF THE OUTLET STRUCTURE.
  - GRADE 60 REINFORCING STEEL REQUIRED. SEE TABLE FOR THE MINIMUM LAP SPLICE LENGTH FOR REINFORCING BARS. ALL REINFORCING STEEL SHALL HAVE A TWO-INCH MINIMUM CLEARANCE FROM EDGE OF CONCRETE, UNLESS OTHERWISE NOTED.
- | BAR SIZE           | #4    | #5    | #6    |
|--------------------|-------|-------|-------|
| MIN. SPLICE LENGTH | 1'-3" | 1'-7" | 2'-0" |
- CONCRETE FOR THE OUTLET STRUCTURE AND FOREBAY SHALL BE CDOT CLASS D CONCRETE.
  - CONCRETE FOR DRAIN CHANNELS SHALL BE CDOT CLASS B CONCRETE
  - EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M-213. EXPANSION JOINT MATERIAL SHALL BE 1/2" THICK, SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE AND THE JOINT SHALL BE SEALED, REFER TO DETAILS.
  - ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 3/8" CHAMFER UNLESS OTHERWISE NOTED.
  - SUBGRADE TO BE 12" THICK CLEAN FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM M698 UNDER STRUCTURE.
  - REFER TO POND DETAILS FOR PRESEDIMENTATION/FOREBAY DESIGN.
  - ENGINEER SHALL BE NOTIFIED PRIOR TO BEGINNING CONSTRUCTION OF OUTLET STRUCTURE TO SCHEDULE OBSERVATION VISITS FOR STRUCTURES.

WQCV WELL-SCREEN NOTES:

- Well-Screen shall be stainless steel and attached by stainless steel bolts along edge of the mounting frame.
- WQCV Well Screen
  - Type of Screen: Stainless steel #93 Vee Wire (Johnson Vee Wire (tm) Stainless Steel Screen or equivalent with 60% open area)
  - Screen slot opening dimension: 0.139" (Screen #93 Vee Wire Slot Opening)
  - Type and Size of Support Rod: TE 0.074"x0.50"
  - Spacing of Support Rod (O.C.): 1.0 Inch
  - Total Screen Thickness: 0.655"
  - Carbon Steel Holding Frame Type: 3/4" x 1.0" angle

**AS-BUILT**  
DATE: 09/30/2022

**CORE ENGINEERING GROUP**  
15004 1ST AVENUE S.  
DENVER, CO 80206  
PHONE: 719.576.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@cegi.com

DATE: \_\_\_\_\_  
DESCRIPTION: \_\_\_\_\_  
NO. \_\_\_\_\_  
PREPARED FOR: **LORSON, LLC**  
212 N. WAHSATCH AVE. SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
CONTACT: JEFF MARK

PROJECT: **THE HILLS COLLECTOR STREET CONSTRUCTION**  
FONTAINE BLVD. - GRAYLING DR  
LORSON BLVD. - WALLEYE DR - LAMPREY DR  
COLORADO SPRINGS, COLORADO

DRAWN: **RLS**  
DESIGNED: **RLS**  
CHECKED: **RLS**

**POND C2.3**  
**FULL SPECTRUM**  
**OUTLET STRUCTURE DETAILS**



DATE: NOV 12, 2020

PROJECT NO. 100.061

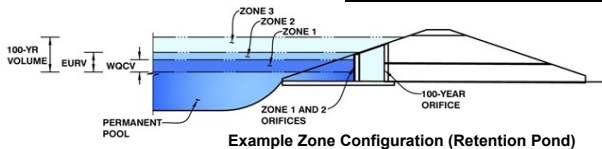
SHEET NUMBER **C9.14**

TOTAL SHEETS: 58

# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

**Project: The Hills at Lorson Ranch**  
**Basin ID: Pond C3-asbuilt**



**Example Zone Configuration (Retention Pond)**

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.27	0.459	Orifice Plate
Zone 2 (EURV)	4.37	0.858	Rectangular Orifice
Zone 3 (100+1/2WQCV)	5.66	1.346	Weir&Pipe (Restrict)
<b>Total (all zones)</b>		<b>2.663</b>	

**User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)**

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft <sup>2</sup>
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

**User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)**

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	8.333E-03	ft <sup>2</sup>
Depth at top of Zone using Orifice Plate =	3.27	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	1.20	sq. inches (diameter = 1-1/4 inches)	Elliptical Slot Area =	N/A	ft <sup>2</sup>

**User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)**

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.02	2.02					
Orifice Area (sq. inches)	1.20	1.20	1.20					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

**User Input: Vertical Orifice (Circular or Rectangular)**

	Zone 2 Rectangular	Not Selected		Zone 2 Rectangular	Not Selected
Invert of Vertical Orifice =	3.32	N/A	ft (relative to basin bottom at Stage = 0 ft)	0.58	N/A
Depth at top of Zone using Vertical Orifice =	4.37	N/A	ft (relative to basin bottom at Stage = 0 ft)	0.25	N/A
Vertical Orifice Height =	6.00	N/A	inches		
Vertical Orifice Width =	14.00	N/A	inches		

**User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))**

	Zone 3 Weir	Not Selected		Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	6.73	N/A	ft (relative to basin bottom at Stage = 0 ft)	6.73	N/A
Overflow Weir Front Edge Length =	6.00	N/A	feet	6.00	N/A
Overflow Weir Grate Slope =	0.00	N/A	H:V	10.87	N/A
Horiz. Length of Weir Sides =	6.00	N/A	feet	25.20	N/A
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	12.60	N/A
Debris Clogging % =	50%	N/A	%		

**User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)**

	Zone 3 Restrictor	Not Selected		Zone 3 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	0.17	N/A	ft (distance below basin bottom at Stage = 0 ft)	2.32	N/A
Outlet Pipe Diameter =	24.00	N/A	inches	0.77	N/A
Restrictor Plate Height Above Pipe Invert =	16.60	N/A	inches	1.96	N/A

**User Input: Emergency Spillway (Rectangular or Trapezoidal)**

Spillway Invert Stage =	9.59	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth =	1.32	feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	12.59	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.66	acres
Freeboard above Max Water Surface =	1.68	feet	Basin Volume at Top of Freeboard =	9.74	acre-ft

micropool = 0 = 5755.15

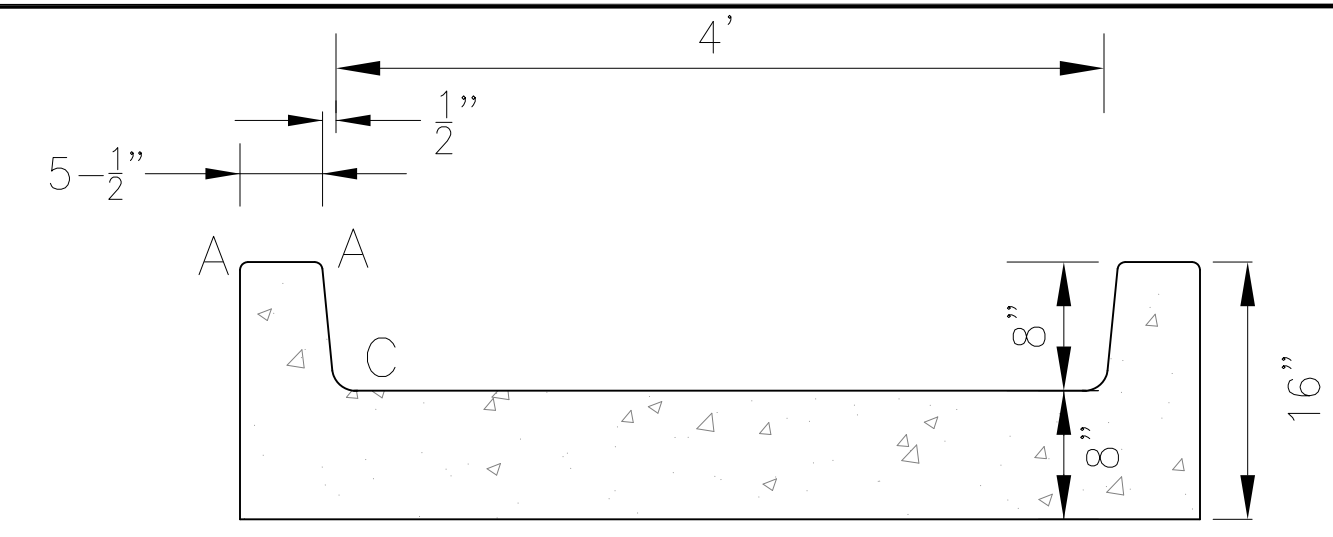
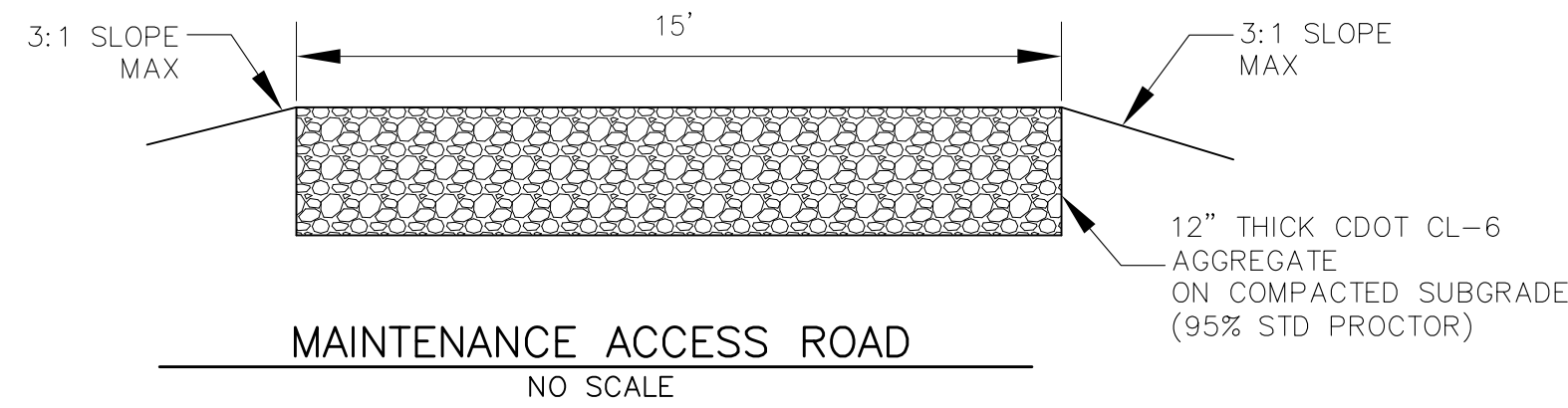
**Routed Hydrograph Results**

*The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF)*

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
One-Hour Rainfall Depth (in)	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft)	0.459	1.316	1.426	2.032	2.557	3.174	3.723	4.395
User Override Inflow Hydrograph Volume (acre-ft)	N/A	N/A	3.549	5.555	7.674	10.126	12.221	14.786
CUHP Predevelopment Peak Q (cfs)	N/A	N/A	5.6	12.2	17.2	27.0	33.3	41.0
OPTIONAL Override Predevelopment Peak Q (cfs)	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre)	N/A	N/A	0.22	0.47	0.66	1.04	1.28	1.58
Peak Inflow Q (cfs)	N/A	N/A	28.0	41.4	54.0	82.0	98.8	115.3
Peak Outflow Q (cfs)	0.2	2.7	3.7	5.0	22.5	30.2	31.4	32.8
Ratio Peak Outflow to Predevelopment Q	N/A	N/A	N/A	0.4	1.3	1.1	0.9	0.8
Structure Controlling Flow	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Gate 1 (fps)	N/A	N/A	N/A	N/A	0.7	1.0	1.0	1.0
Max Velocity through Gate 2 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours)	38	48	50	48	44	39	34	29
Time to Drain 99% of Inflow Volume (hours)	40	52	57	59	57	55	53	51
Maximum Ponding Depth (ft)	3.27	4.37	5.09	6.39	7.20	7.91	8.50	9.24
Area at Maximum Ponding Depth (acres)	0.57	0.93	1.06	1.18	1.26	1.32	1.39	1.48
Maximum Volume Stored (acre-ft)	0.462	1.320	2.044	3.493	4.493	5.407	6.193	7.253

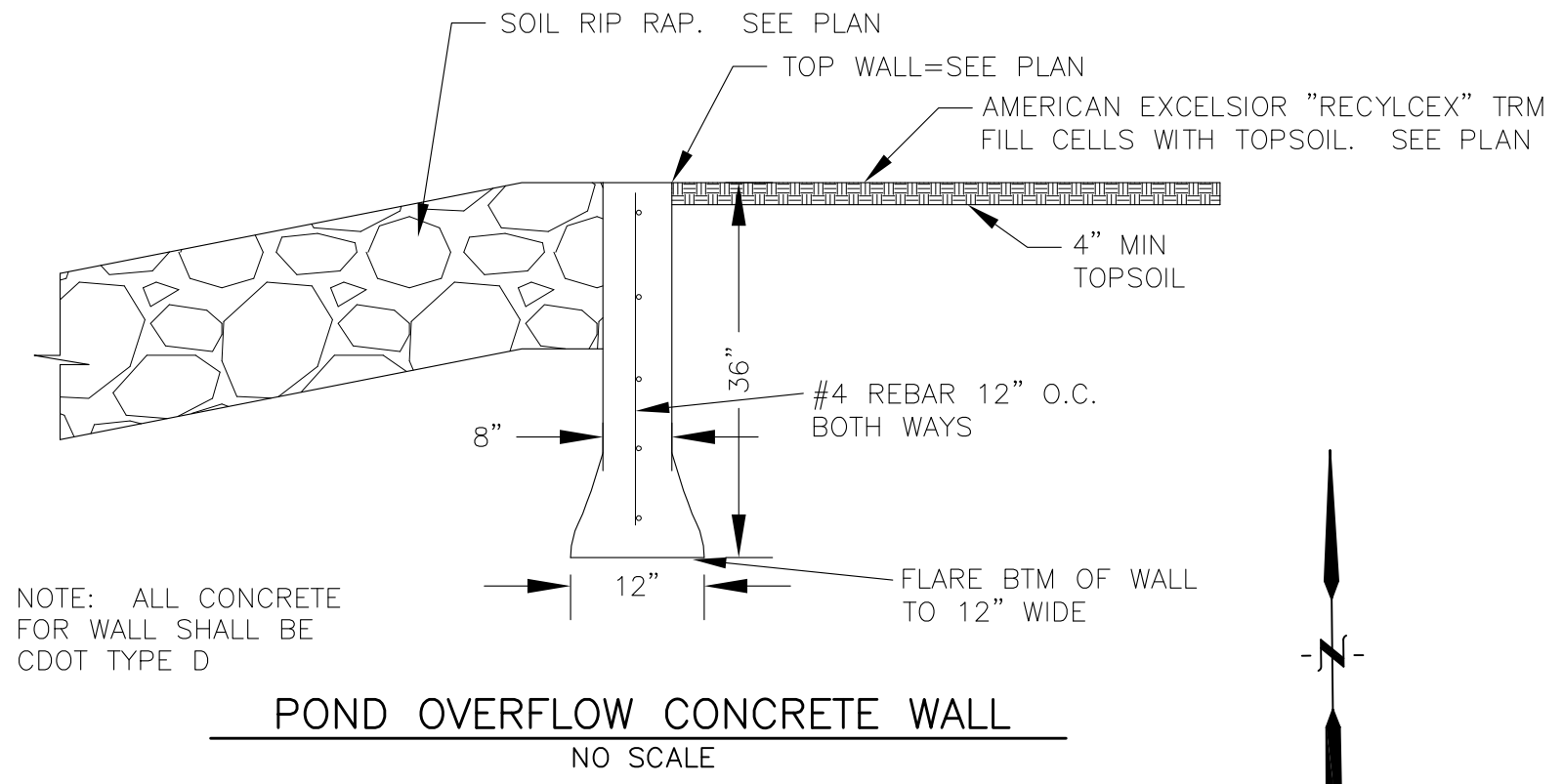
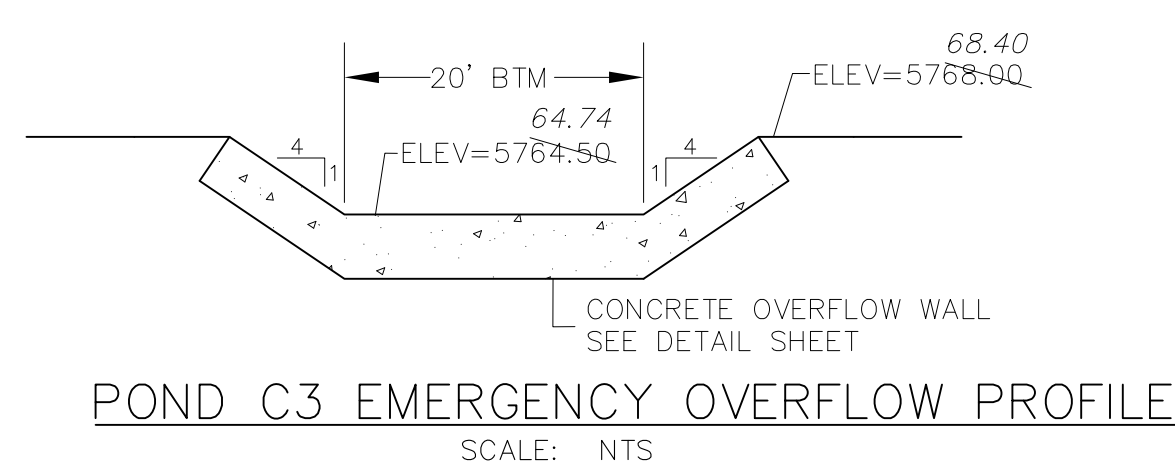
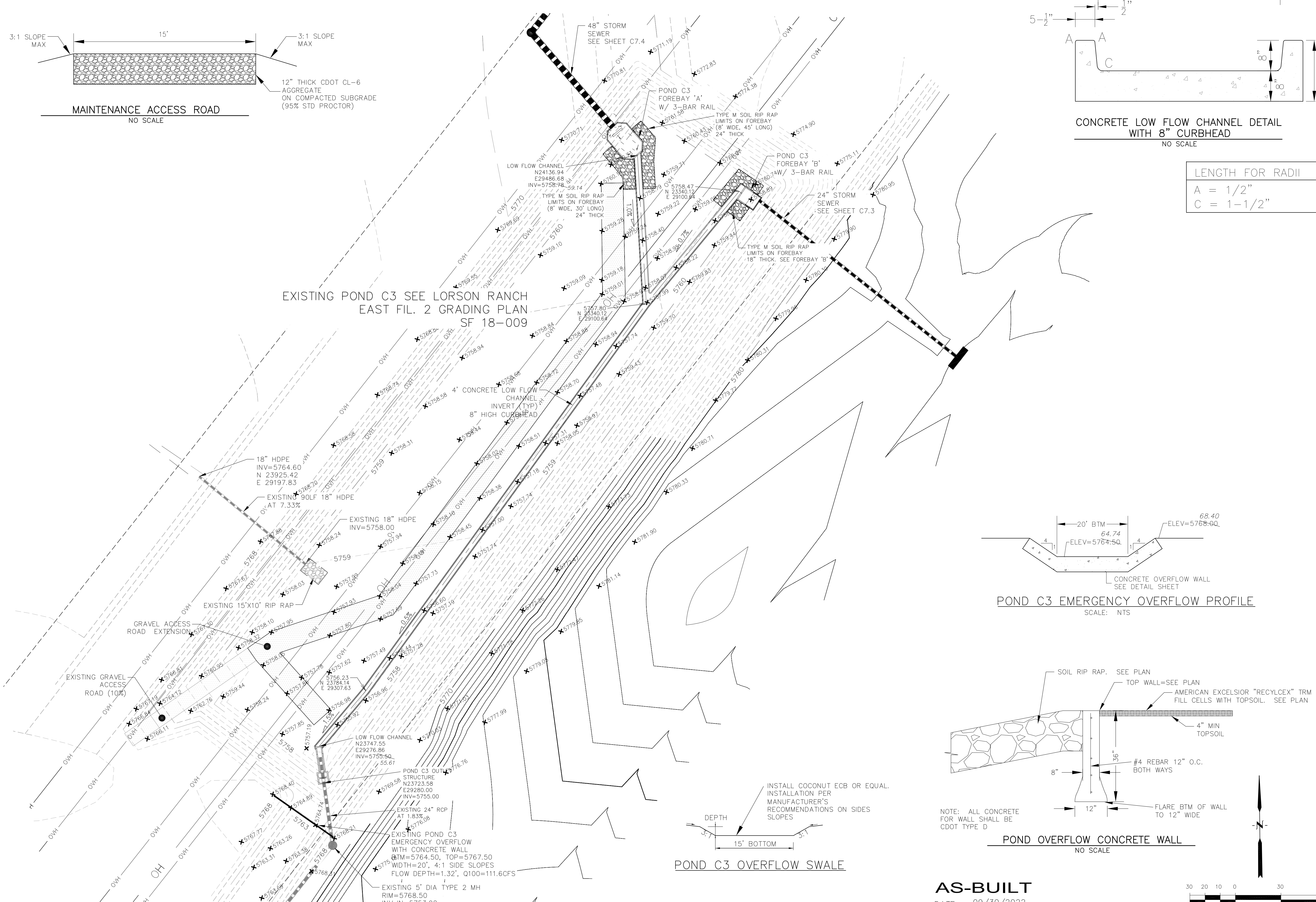






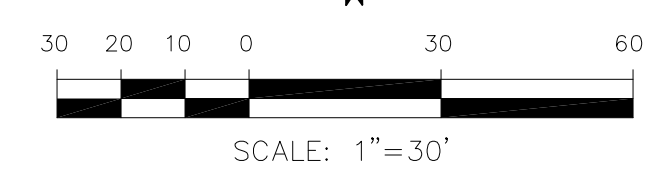
LENGTH FOR RADII	
A	= 1/2"
C	= 1-1/2"

EXISTING POND C3 SEE LORSON RANCH EAST FIL. 2 GRADING PLAN SF 18-009



NOTE: ALL CONCRETE FOR WALL SHALL BE CDOT TYPE D

AS-BUILT  
DATE: 09/30/2022



**CORE ENGINEERING GROUP**  
19004 1ST AVE. SUITE 100  
DENVER, CO 80202  
PHONE: 719.570.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@cegi.com

DATE: \_\_\_\_\_  
DESCRIPTION: \_\_\_\_\_  
NO: \_\_\_\_\_

PREPARED FOR: **LORSON, LLC**  
212 N. WAHSATCH AVE, SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
CONTACT: JEFF MARK

PROJECT: **THE HILLS COLLECTOR STREET CONSTRUCTION**  
FONTAINE BLVD. - GRAYLING DR  
LORSON BLVD - WALLEYE DR - LAMPREY DR  
COLORADO SPRINGS, COLORADO

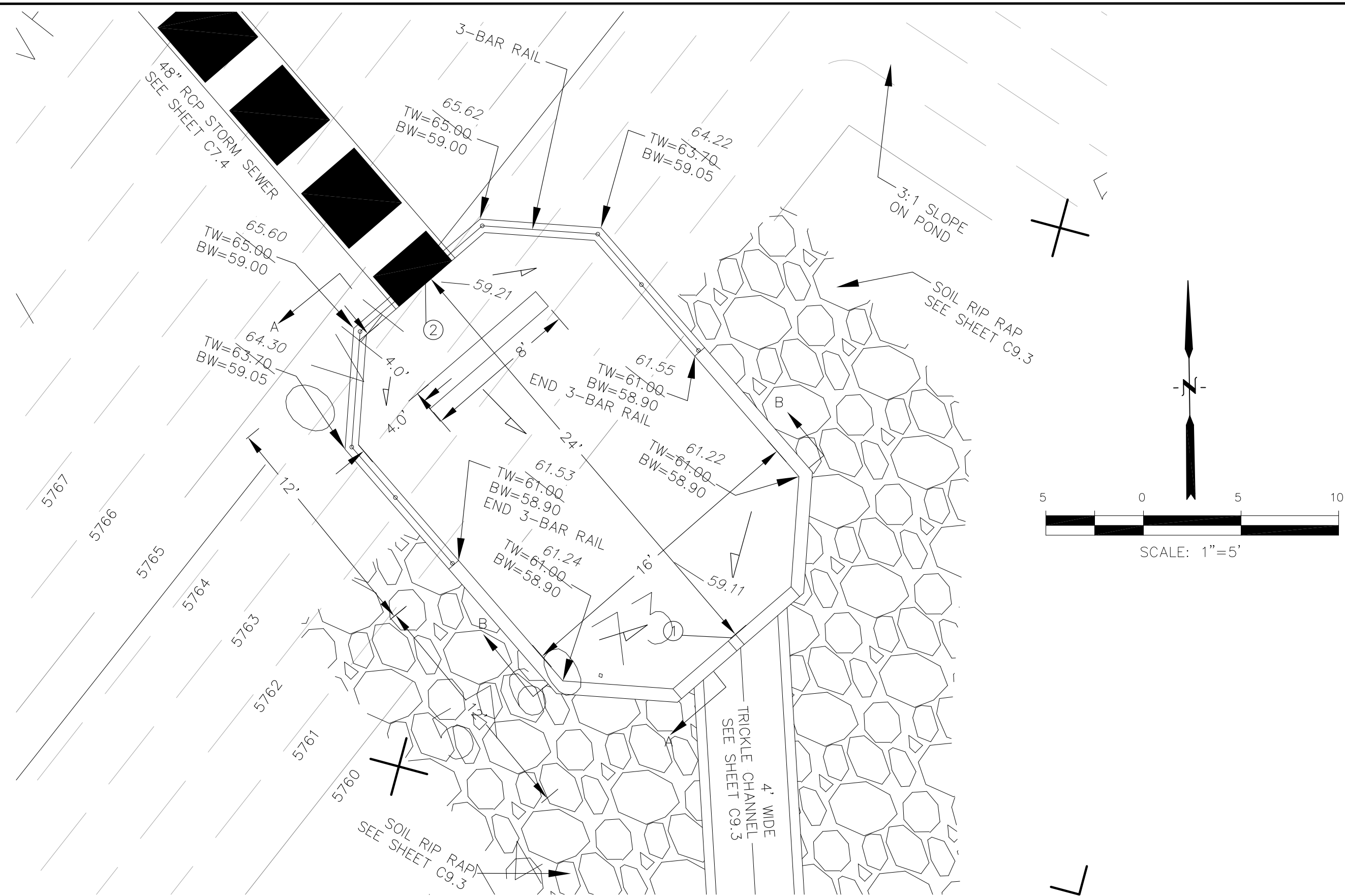
DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

**POND C3 FOREBAY, LOW FLOW CHANNEL AND OUTLET STRUCTURE LAYOUT**

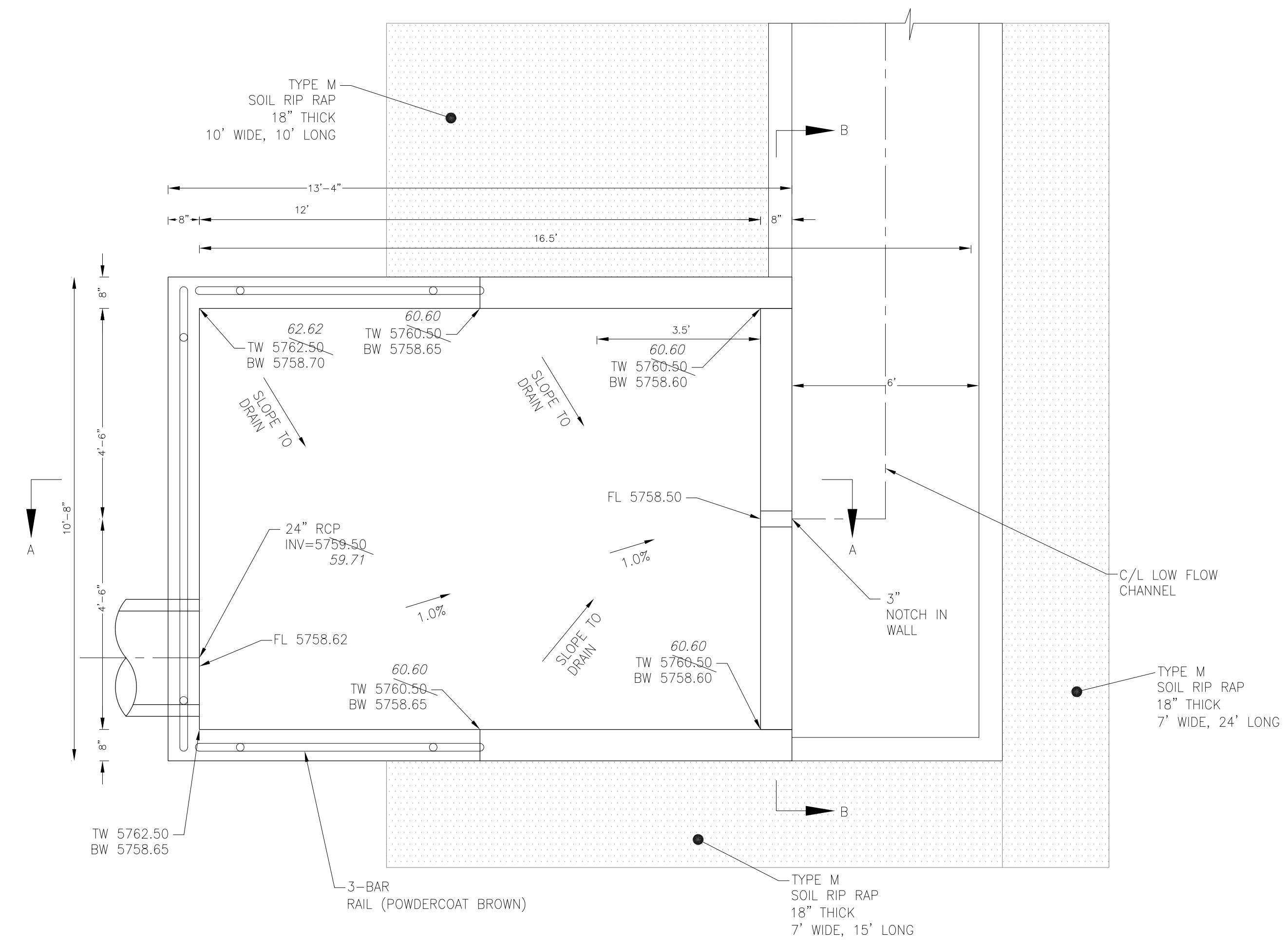
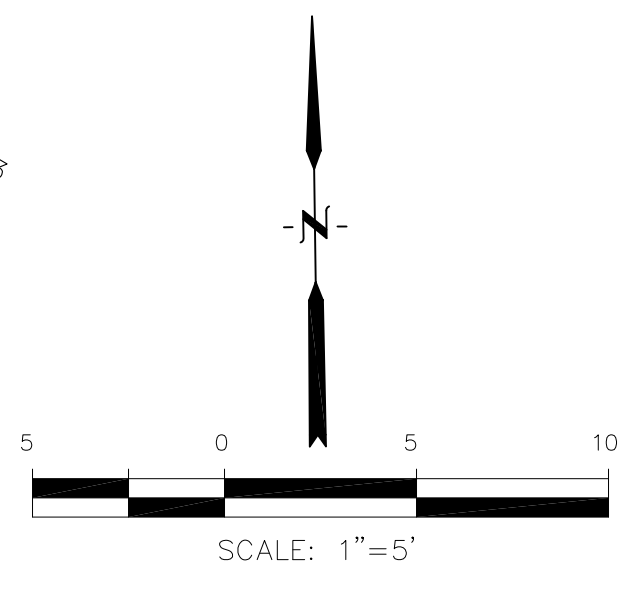


DATE: NOV 12, 2020  
PROJECT NO: 100.061  
SHEET NUMBER: C9.8  
TOTAL SHEETS: 58



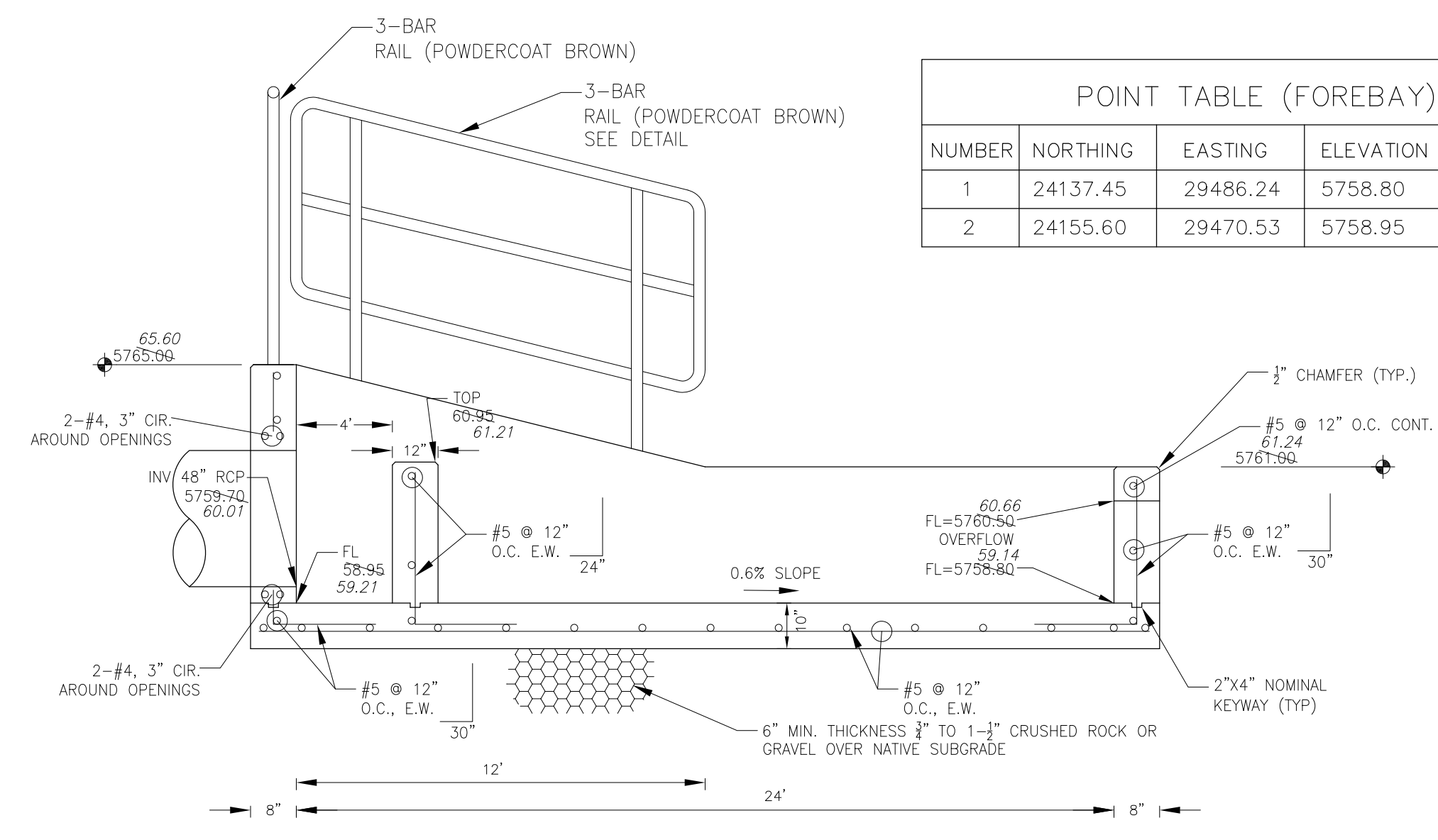


POND C3 - FOREBAY 'A' LAYOUT  
SCALE: 1"=5'

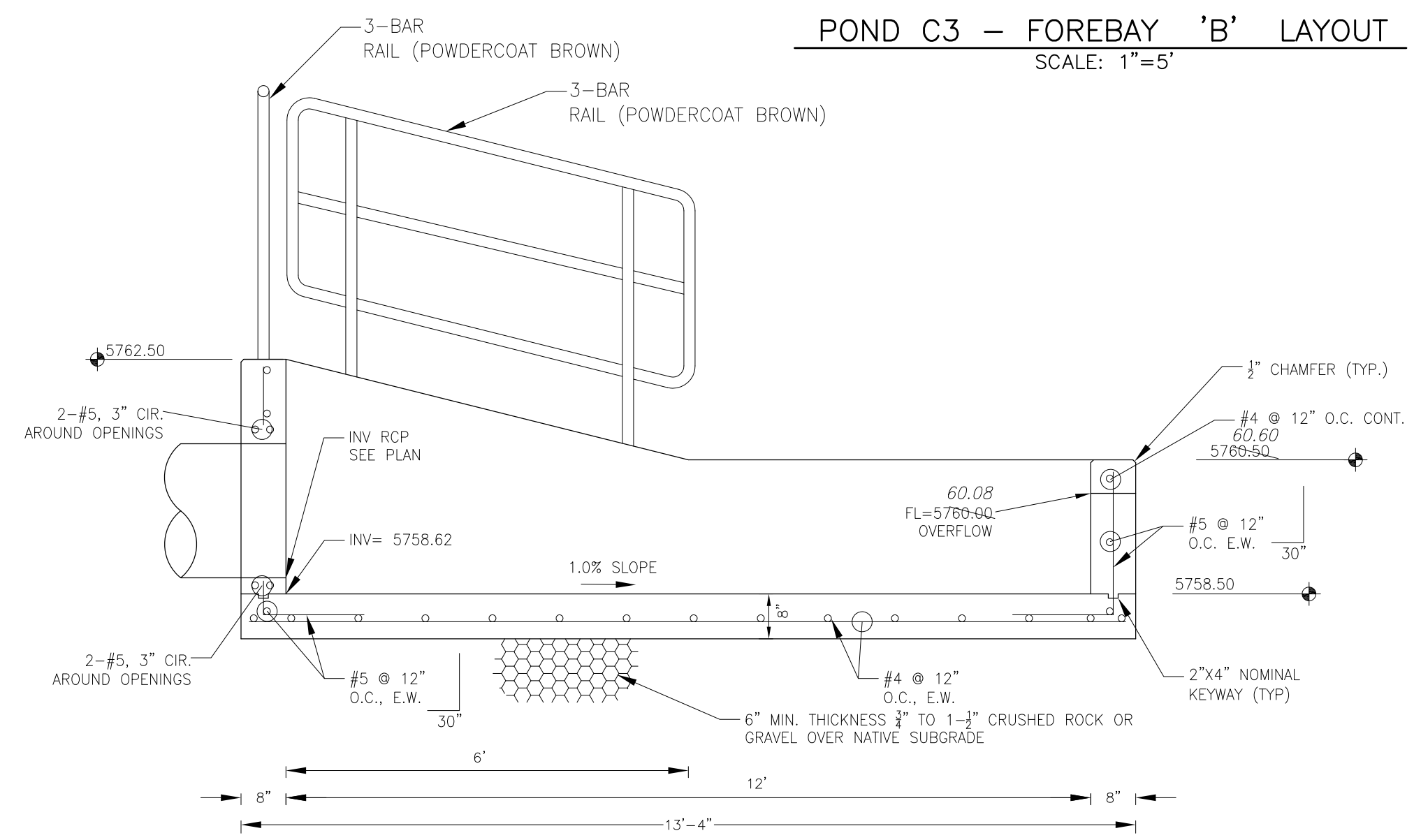


POND C3 - FOREBAY 'B' LAYOUT  
SCALE: 1"=5'

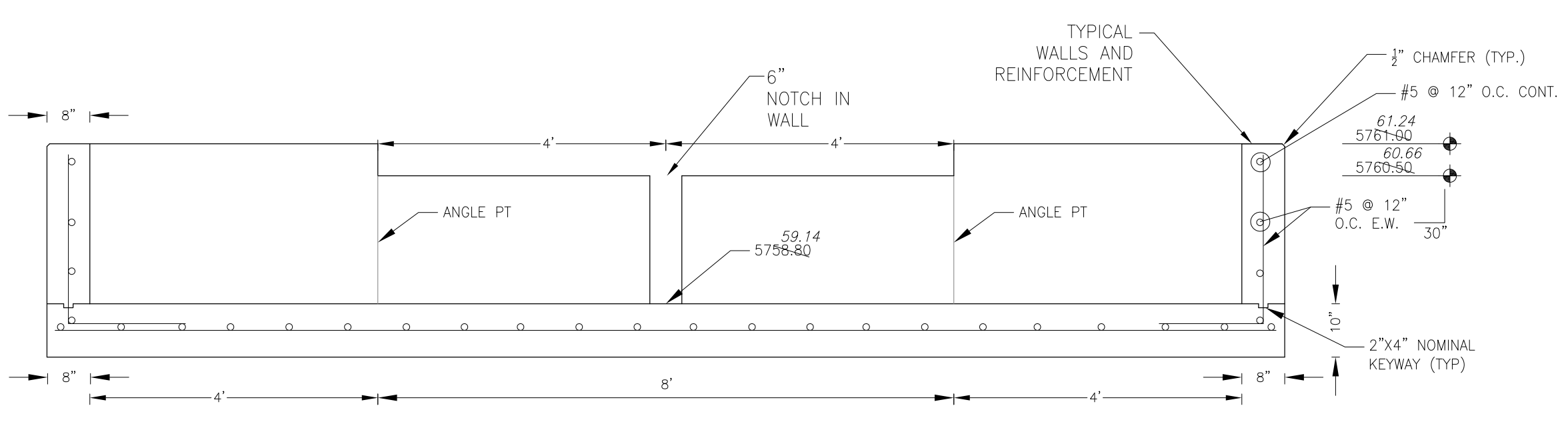
POINT TABLE (FOREBAY)				
NUMBER	NORTHING	EASTING	ELEVATION	NOTES
1	24137.45	29486.24	5758.80	FOREBAY BOTTOM
2	24155.60	29470.53	5758.95	FOREBAY BOTTOM, INV 48\"/>



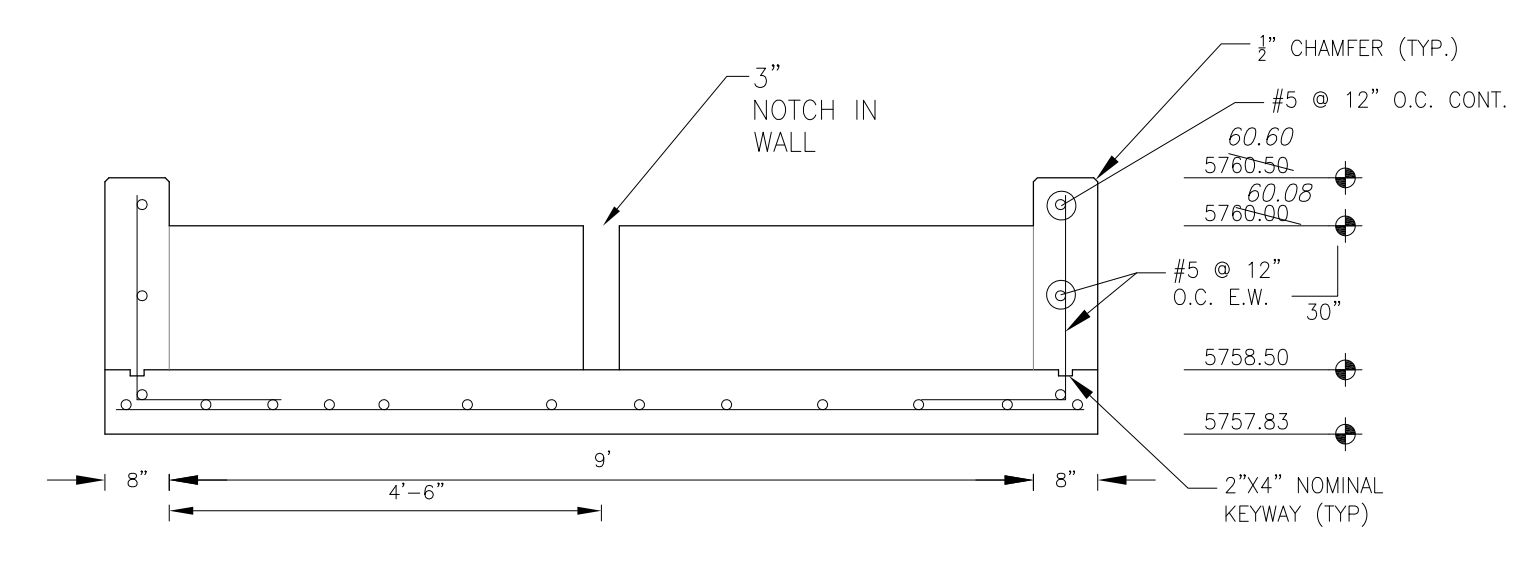
FOREBAY 'A' SECTION A-A  
NO SCALE



FOREBAY 'B' SECTION A-A  
NO SCALE



FOREBAY 'A' SECTION B-B  
NO SCALE



FOREBAY 'B' SECTION B-B  
NO SCALE

NOTE: ALL CONCRETE FOR FOREBAY SHALL BE CDOT TYPE D

AS-BUILT  
DATE: 09/30/2022

**CORE ENGINEERING GROUP**  
15004 151<sup>ST</sup> AVENUE, S.  
DENVER, CO 80232  
PHONE: 719.570.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@ceg1.com

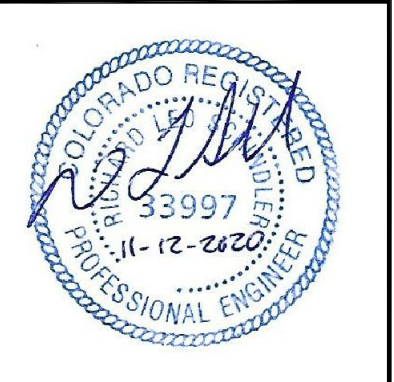
DATE: \_\_\_\_\_  
DESCRIPTION: \_\_\_\_\_  
NO: \_\_\_\_\_

PREPARED FOR:  
**LORSON, LLC**  
212 N. WAHSATCH AVE, SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
CONTACT: JEFF MARK

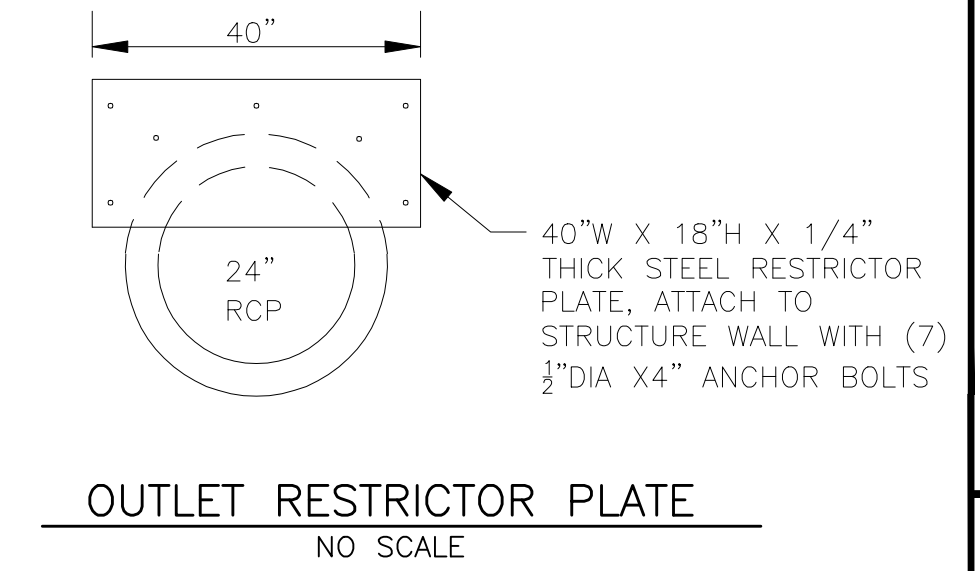
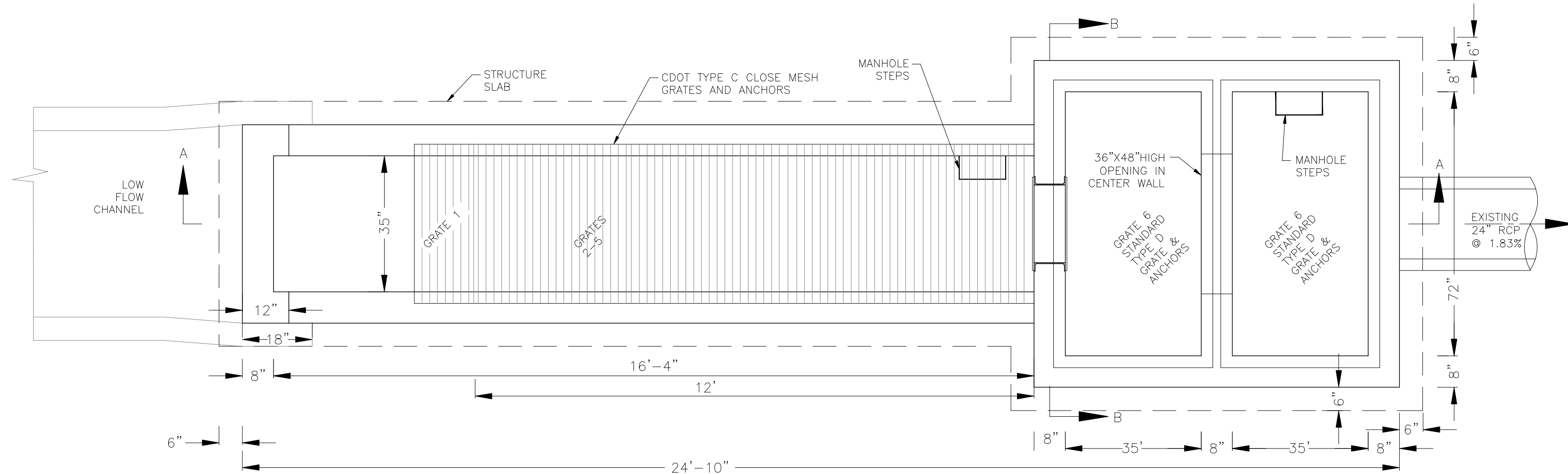
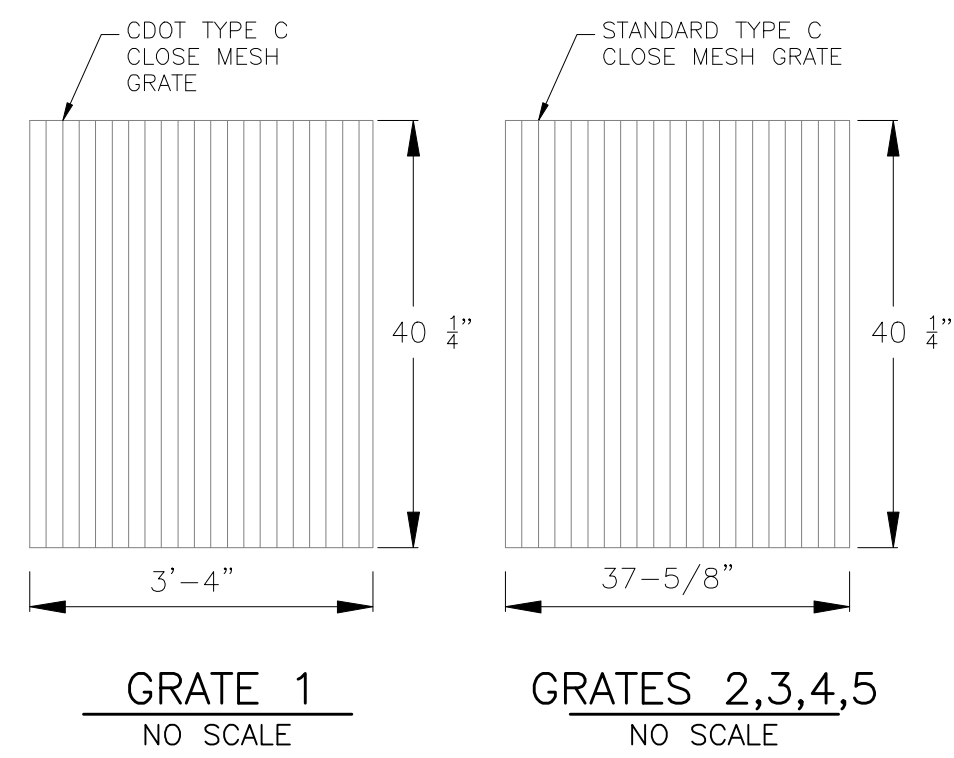
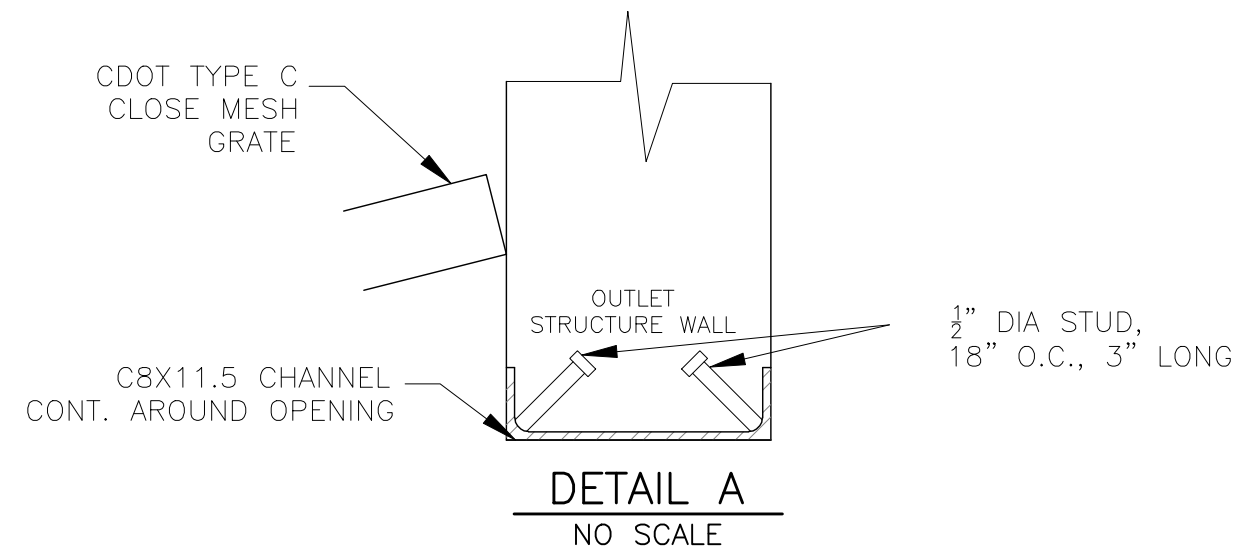
PROJECT:  
**THE HILLS COLLECTOR STREET CONSTRUCTION**  
FONTAINE BLVD - GRAYLING DR  
LORSON BLVD - WALLEYE DR - LAMPREY DR  
COLORADO SPRINGS, COLORADO  
CONTACT: JEFF MARK

DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

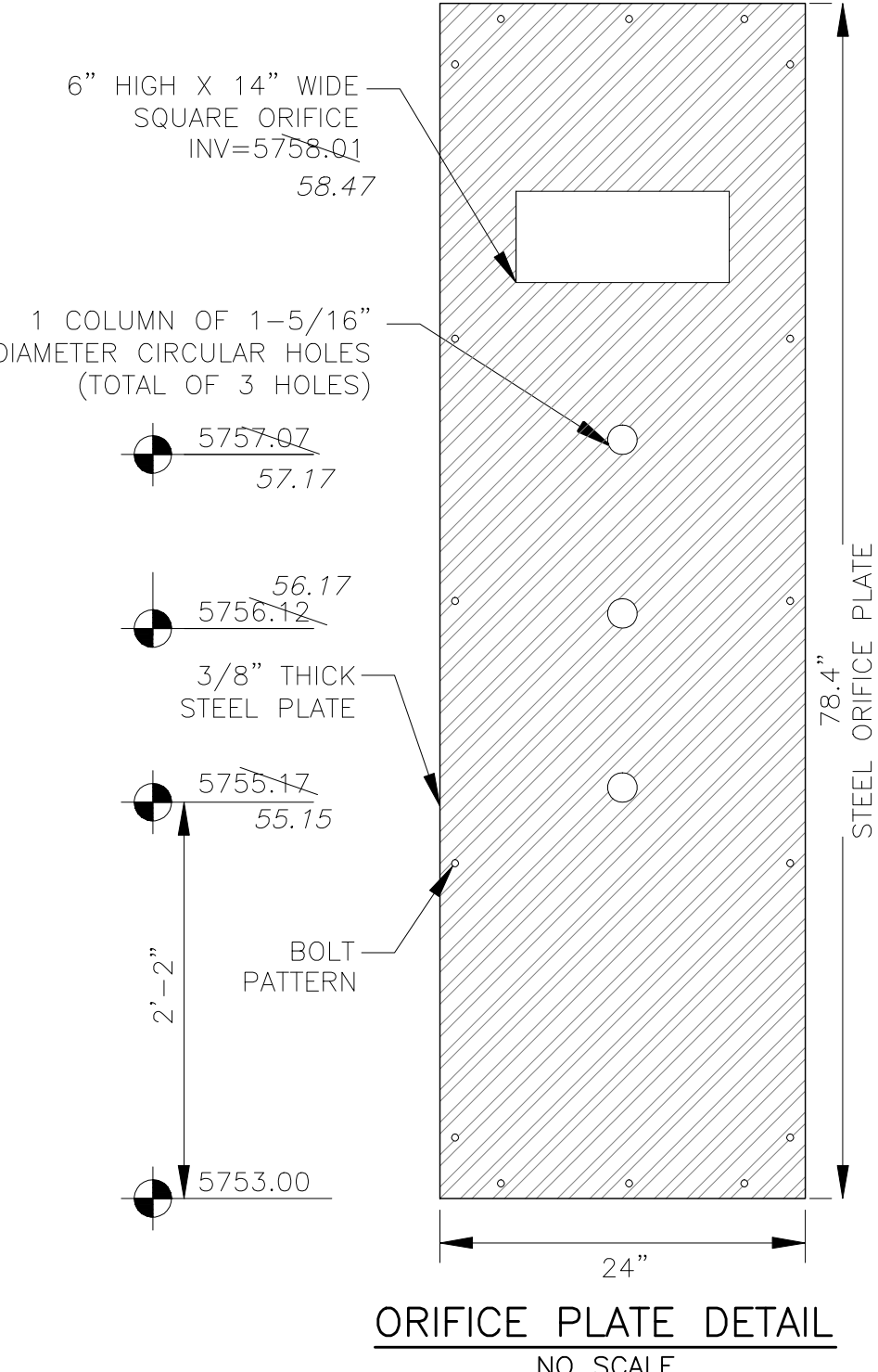
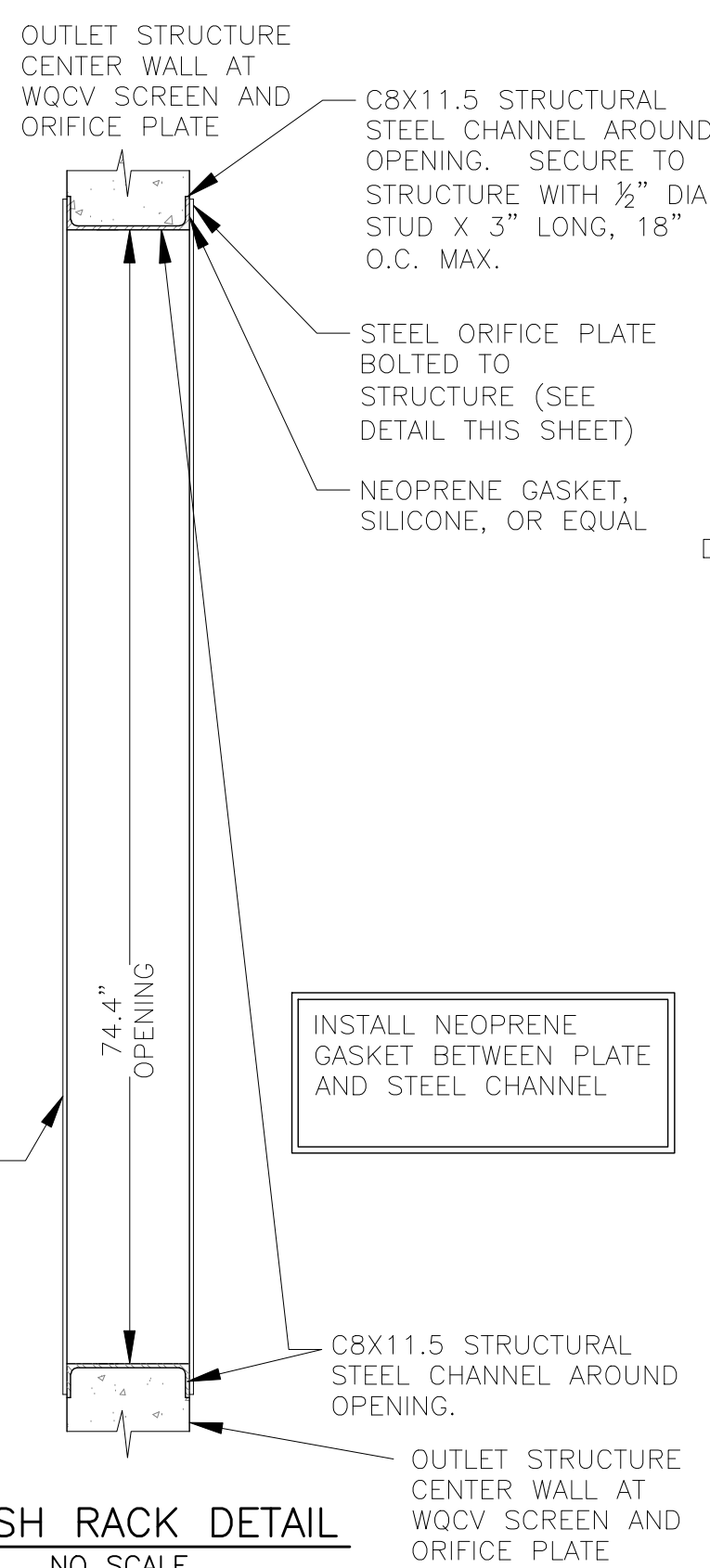
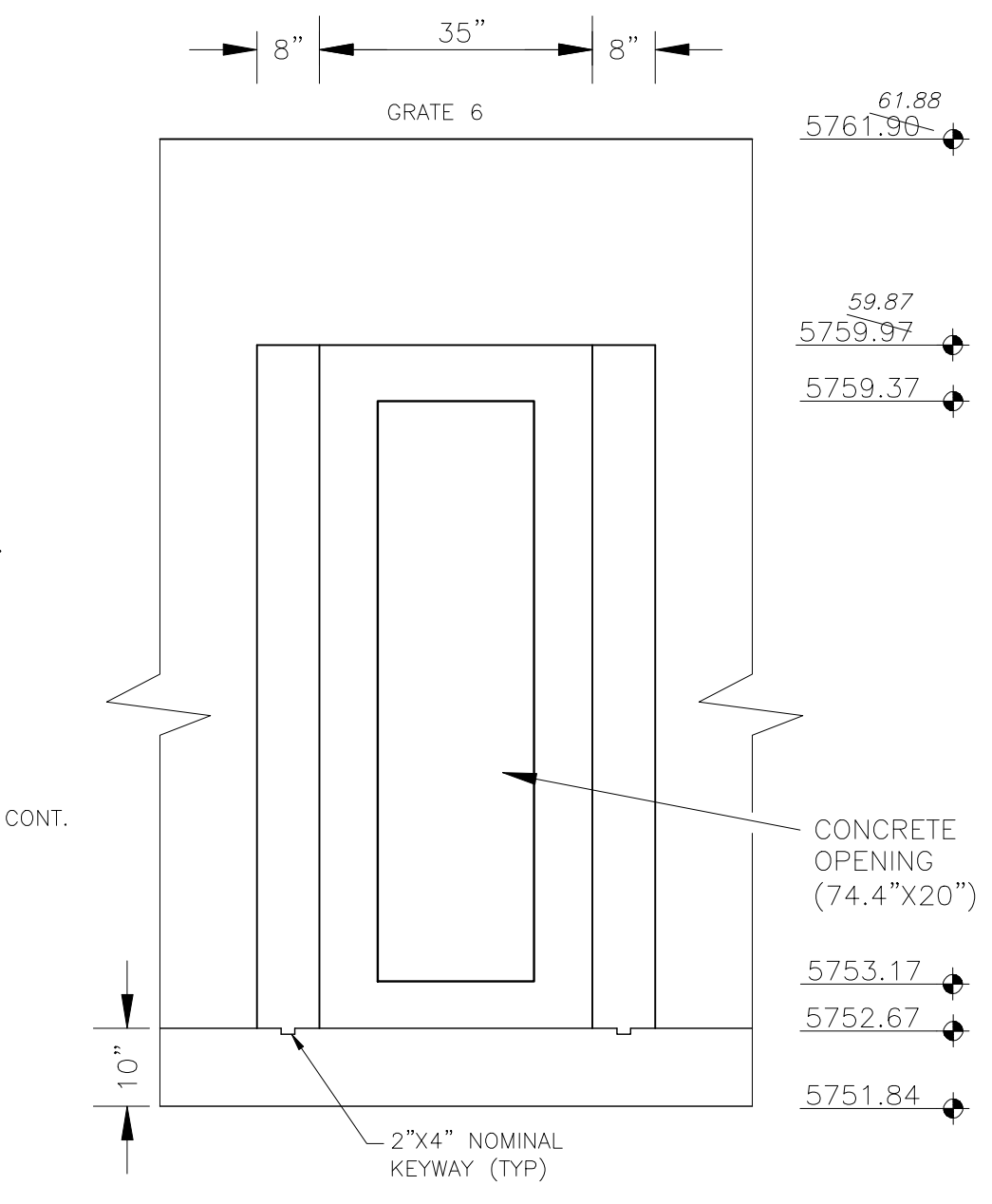
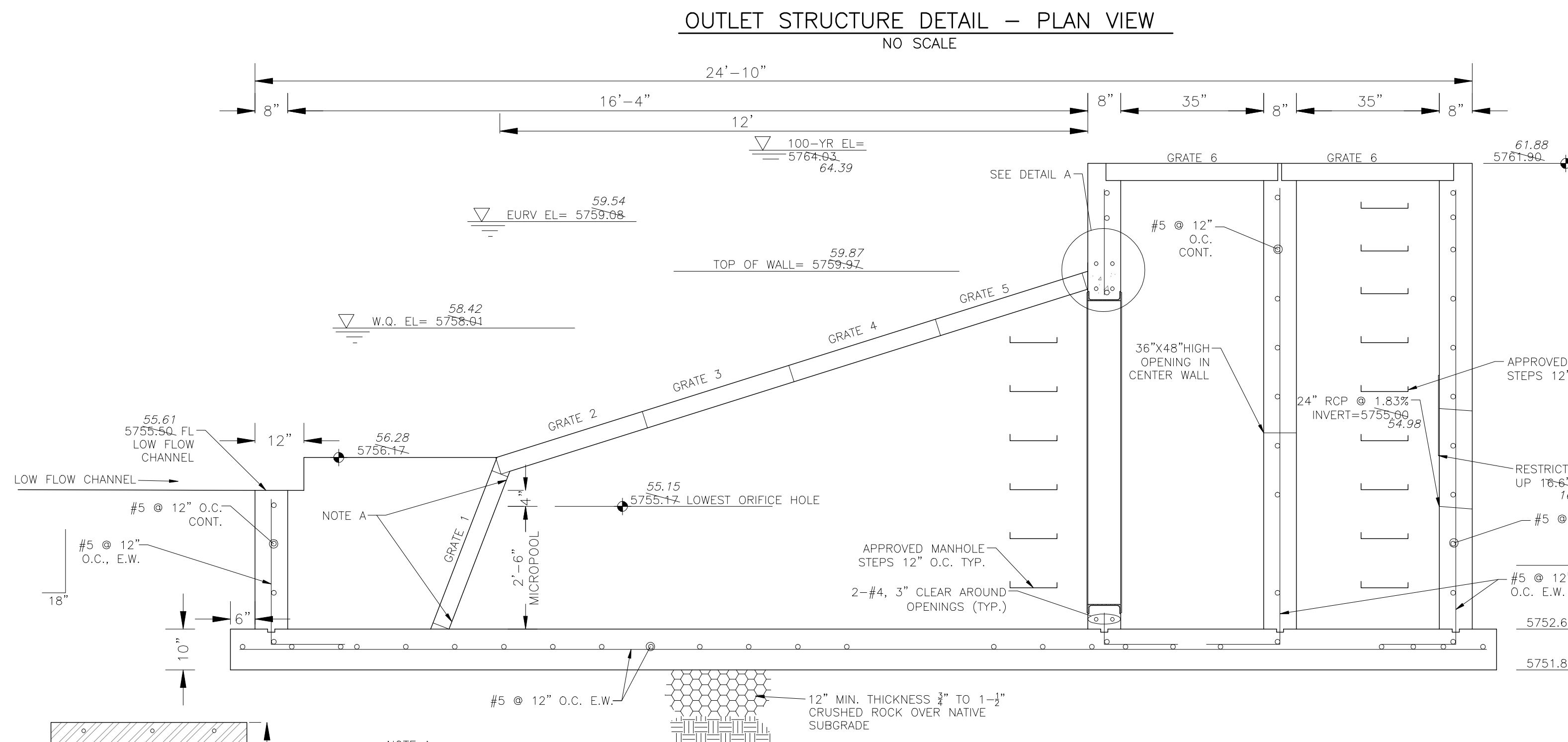
POND C3  
FOREBAY DETAILS



DATE: NOV 12, 2020  
PROJECT NO: 100.061  
SHEET NUMBER: C9.9  
TOTAL SHEETS: 58



NOTE: AFTER CONCRETE STRUCTURE HAS BEEN POURED ALL GRATE DIMENSIONS SHALL BE FIELD VERIFIED PRIOR TO GRATE CONSTRUCTION



NOTE A: SLOT FOR CLOSE MESH GRATES

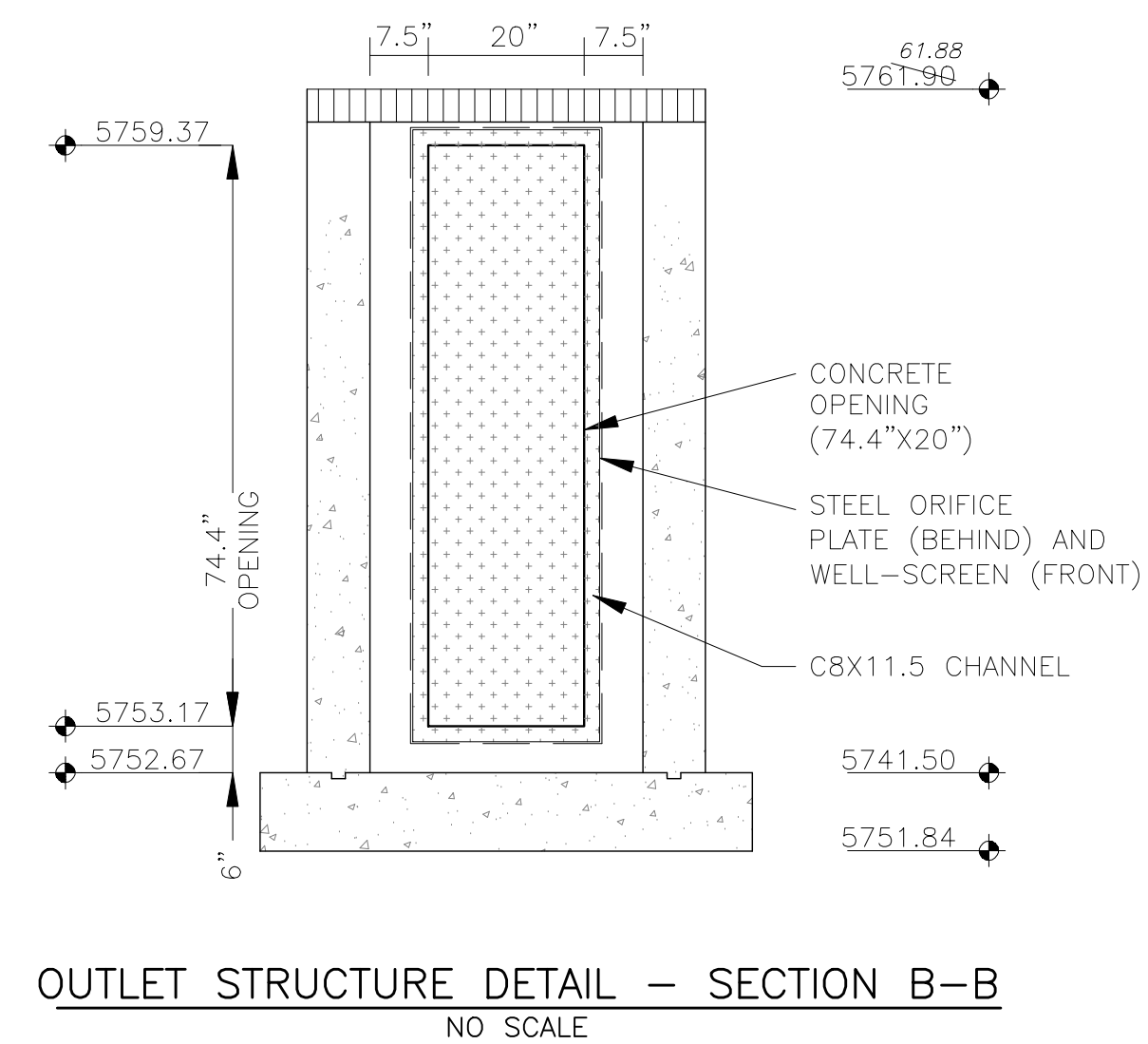
OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:

- PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL COMPONENTS OF THE OUTLET STRUCTURE.
  - GRADE 60 REINFORCING STEEL REQUIRED. SEE TABLE FOR THE MINIMUM LAP SPLICE LENGTH FOR REINFORCING BARS. ALL REINFORCING STEEL SHALL HAVE A TWO-INCH MINIMUM CLEARANCE FROM EDGE OF CONCRETE, UNLESS OTHERWISE NOTED.
- | BAR SIZE           | #4    | #5    | #6    |
|--------------------|-------|-------|-------|
| MIN. SPLICE LENGTH | 1'-3" | 1'-7" | 2'-0" |
- CONCRETE FOR THE OUTLET STRUCTURE AND FOREBAY SHALL BE CDOT CLASS D CONCRETE.
  - CONCRETE FOR DRAIN CHANNELS SHALL BE CDOT CLASS B CONCRETE.
  - EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M-213. EXPANSION JOINT MATERIAL SHALL BE 1/2" THICK, SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE AND THE JOINT SHALL BE SEALED, REFER TO DETAILS.
  - ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 3/8" CHAMFER UNLESS OTHERWISE NOTED.
  - SUBGRADE TO BE 12" THICK CLEAN FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM M698 UNDER STRUCTURE.
  - REFER TO POND DETAILS FOR PRESEDIMENTATION/FOREBAY DESIGN.
  - ENGINEER SHALL BE NOTIFIED PRIOR TO BEGINNING CONSTRUCTION OF OUTLET STRUCTURE TO SCHEDULE OBSERVATION VISITS FOR STRUCTURES.

WQCV WELL-SCREEN NOTES:

- Well-Screen shall be stainless steel and attached by stainless steel bolts along edge of the mounting frame.
- WQCV Well Screen
  - Type of Screen: Stainless steel #93 Vee Wire (Johnson Vee Wire (tm) Stainless Steel Screen or equivalent with 60% open area)
  - Screen slot opening dimension: 0.139" (Screen #93 Vee Wire Slot Opening)
  - Type and Size of Support Rod: TE 0.074"x0.50"
  - Spacing of Support Rod (O.C.): 1.0 Inch
  - Total Screen Thickness: 0.655"
  - Carbon Steel Holding Frame Type: 3/4" x 1.0" angle

**AS-BUILT**  
DATE: 09/30/2022



**CORE ENGINEERING GROUP**  
15004 1ST AVENUE S.  
BURNING WOODS, CO 80906  
PHONE: 719.576.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@cegi.com

PROJECT FOR: **LORSON, LLC**  
212 N. WAHSATCH AVE SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
CONTACT: JEFF MARK

PROJECT: **THE HILLS COLLECTOR STREET CONSTRUCTION**  
FONTAINE BLVD - GRAYLING DR  
LORSON BLVD - WALLEYE DR - LAMPREY DR  
COLORADO SPRINGS, COLORADO

DATE: NOV 12, 2020  
PROJECT NO: 100.061  
SHEET NUMBER: **C9.15**  
TOTAL SHEETS: 58

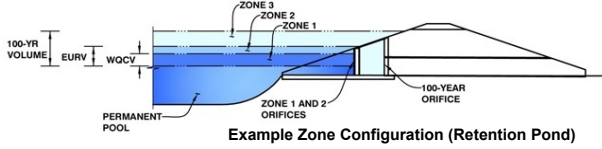
**POND C3 FULL SPECTRUM OUTLET STRUCTURE DETAILS**

**AS-BUILT**  
DATE: 09/30/2022

# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

**Project: The Hills at Lorson Ranch**  
**Basin ID: Pond C4-asbuilt**



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.06	1.488	Orifice Plate
Zone 2 (EURV)	5.56	2.980	Rectangular Orifice
Z3 (100+1/2WQCV)	8.58	4.225	Weir&Pipe (Restrict)
<b>Total (all zones)</b>		<b>8.692</b>	

User Input: Orifice at Underdrain Outlet (typically used to drain WOCV in a Filtration BMP)

Underdrain Orifice Invert Depth =  ft (distance below the filtration media surface)  
 Underdrain Orifice Diameter =  inches

Calculated Parameters for Underdrain  
 Underdrain Orifice Area =  ft<sup>2</sup>  
 Underdrain Orifice Centroid =  feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WOCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =  ft (relative to basin bottom at Stage = 0 ft)  
 Depth at top of Zone using Orifice Plate =  ft (relative to basin bottom at Stage = 0 ft)  
 Orifice Plate: Orifice Vertical Spacing =  inches  
 Orifice Plate: Orifice Area per Row =  sq. inches (use rectangular openings)

Calculated Parameters for Plate  
 WQ Orifice Area per Row =  ft<sup>2</sup>  
 Elliptical Half-Width =  feet  
 Elliptical Slot Centroid =  feet  
 Elliptical Slot Area =  ft<sup>2</sup>

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.00	2.00					
Orifice Area (sq. inches)	4.68	4.68	4.68					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	<input type="text" value="3.00"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	<input type="text" value="5.56"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	<input type="text" value="6.00"/>	<input type="text" value="N/A"/>	inches
Vertical Orifice Width =	<input type="text" value="16.39"/>	<input type="text" value="N/A"/>	inches

Calculated Parameters for Vertical Orif  
 Vertical Orifice Area =  ft<sup>2</sup>  
 Vertical Orifice Centroid =  feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe).

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	<input type="text" value="5.51"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	<input type="text" value="6.00"/>	<input type="text" value="N/A"/>	feet
Overflow Weir Gate Slope =	<input type="text" value="0.00"/>	<input type="text" value="N/A"/>	H:V
Horiz. Length of Weir Sides =	<input type="text" value="6.00"/>	<input type="text" value="N/A"/>	feet
Overflow Gate Open Area % =	<input type="text" value="70%"/>	<input type="text" value="N/A"/>	% , gate open area/total area
Debris Clogging % =	<input type="text" value="50%"/>	<input type="text" value="N/A"/>	%

Calculated Parameters for Overflow We  
 Height of Gate Upper Edge, H<sub>t</sub> =  feet  
 Overflow Weir Slope Length =  feet  
 Gate Open Area / 100-yr Orifice Area =  N/A  
 Overflow Gate Open Area w/o Debris =  N/A  
 Overflow Gate Open Area w/ Debris =  N/A

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	<input type="text" value="0.00"/>	<input type="text" value="N/A"/>	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	<input type="text" value="24.00"/>	<input type="text" value="N/A"/>	inches
Restrictor Plate Height Above Pipe Invert =	<input type="text" value="24.00"/>	<input type="text" value="N/A"/>	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pl  
 Outlet Orifice Area =  ft<sup>2</sup>  
 Outlet Orifice Centroid =  feet  
 Half-Central Angle of Restrictor Plate on Pipe =  N/A

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	<input type="text" value="10.00"/>	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	<input type="text" value="30.00"/>	feet
Spillway End Slopes =	<input type="text" value="4.00"/>	H:V
Freeboard above Max Water Surface =	<input type="text" value="1.13"/>	feet

Calculated Parameters for Spillway  
 Spillway Design Flow Depth =  feet  
 Stage at Top of Freeboard =  feet  
 Basin Area at Top of Freeboard =  acres  
 Basin Volume at Top of Freeboard =  acre-ft

micropool = 0 = 5765

## Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF)

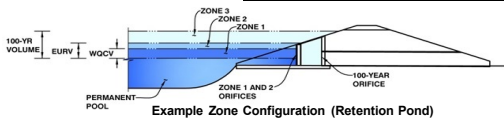
	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =								
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	1.488	4.468	4.607	6.475	8.109	10.045	11.748	13.830
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.607	6.475	8.109	10.045	11.748	13.830
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	17.5	39.6	56.8	90.6	111.9	138.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.22	0.49	0.70	1.12	1.38	1.71
Peak Inflow Q (cfs) =	N/A	N/A	93.5	131.6	158.6	200.0	232.9	277.2
Peak Outflow Q (cfs) =	0.7	6.2	5.5	18.5	34.6	38.4	40.9	44.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.6	0.4	0.4	0.3
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Gate 1 (fps) =	N/A	0.02	N/A	0.5	1.1	1.2	1.3	1.4
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	46	47	47	45	43	42	40
Time to Drain 99% of Inflow Volume (hours) =	40	50	51	52	51	51	50	50
Maximum Ponding Depth (ft) =	3.06	5.56	5.13	5.89	6.24	7.45	8.30	9.48
Area at Maximum Ponding Depth (acres) =	1.10	1.28	1.25	1.31	1.33	1.42	1.49	1.59
Maximum Volume Stored (acre-ft) =	1.497	4.476	3.919	4.903	5.364	7.017	8.272	10.092

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)

Project: The Hills at Lorson Ranch

Basin ID: Pond C4-asbuilt



micropool = 0 = 5765

Depth Increment = 0.20 ft

Watershed Information

Table with watershed parameters: Selected BMP Type = EDB, Watershed Area = 81.00 acres, Watershed Length = 2,300 ft, etc.

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Table with water quality and detention parameters: Water Quality Capture Volume (WQCV) = 1.488 acre-feet, Excess Urban Runoff Volume (EURV) = 4.468 acre-feet, etc.

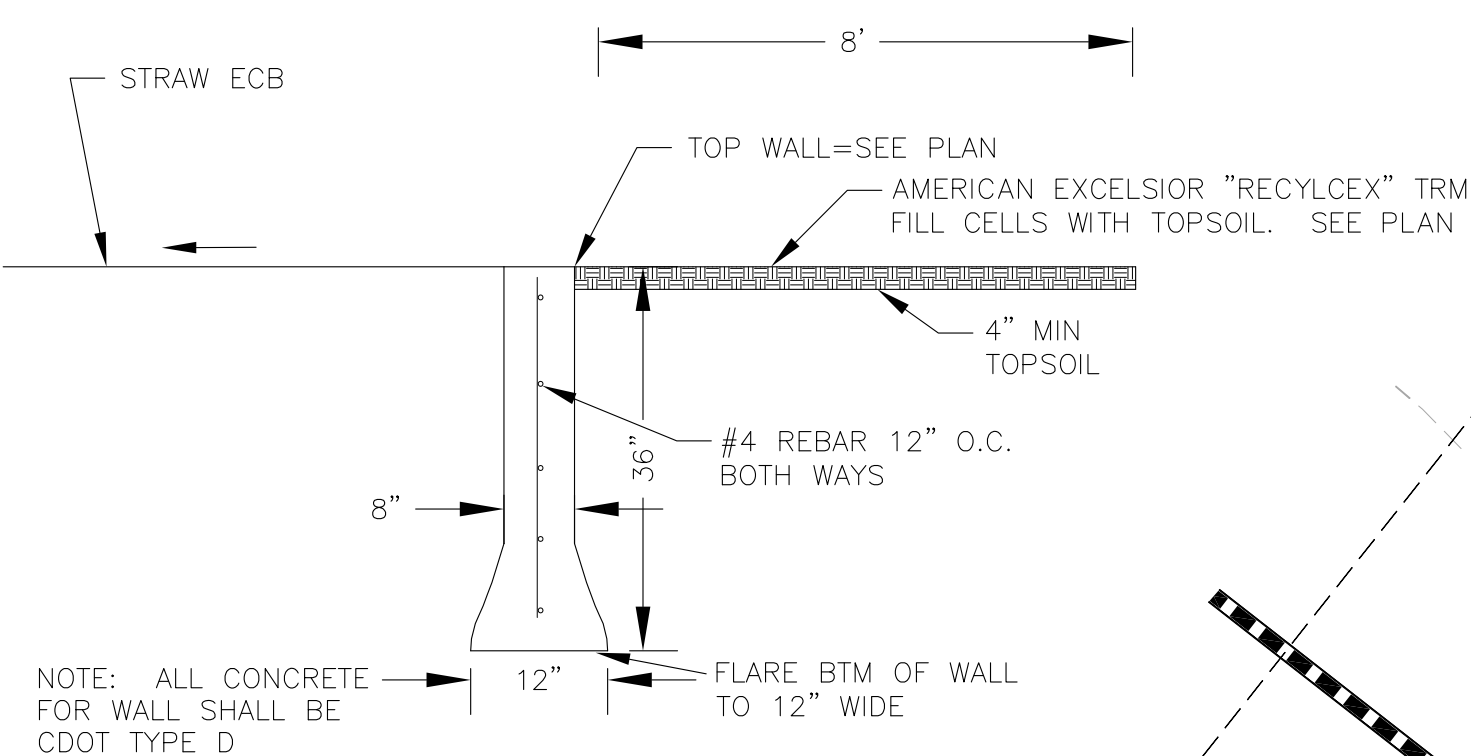
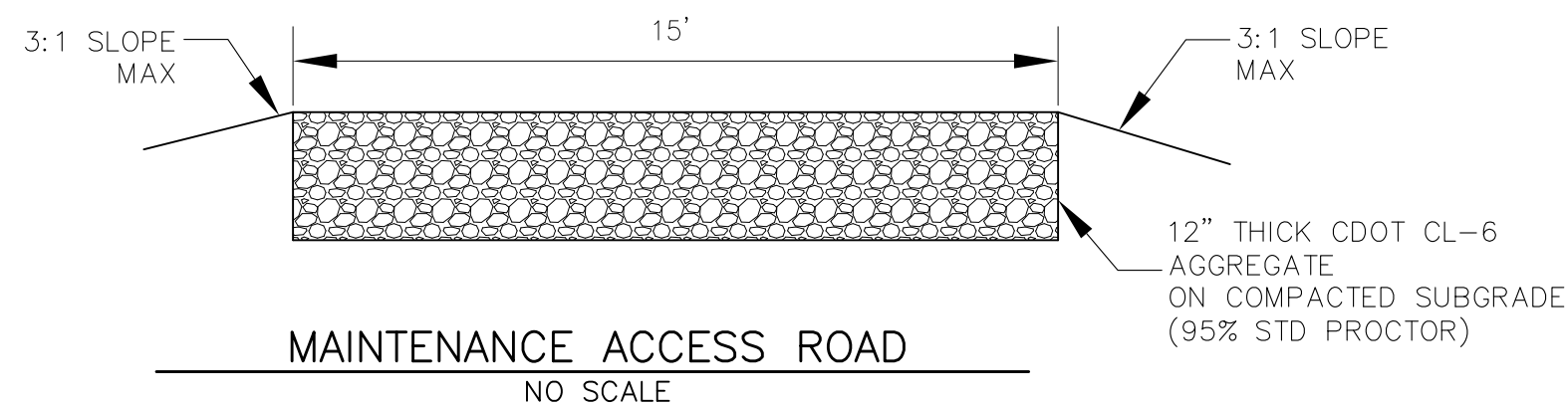
Optional User Overrides

Table for optional user overrides with columns for parameter name and value (e.g., 1.19 inches, 1.50 inches, etc.).

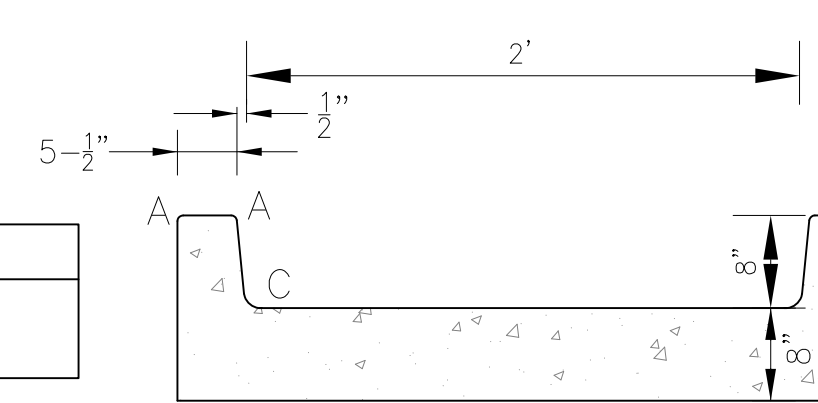
Define Zones and Basin Geometry

Table for defining zones and basin geometry: Zone 1 Volume (WQCV) = 1.488 acre-feet, Zone 2 Volume (EURV - Zone 1) = 2.980 acre-feet, etc.

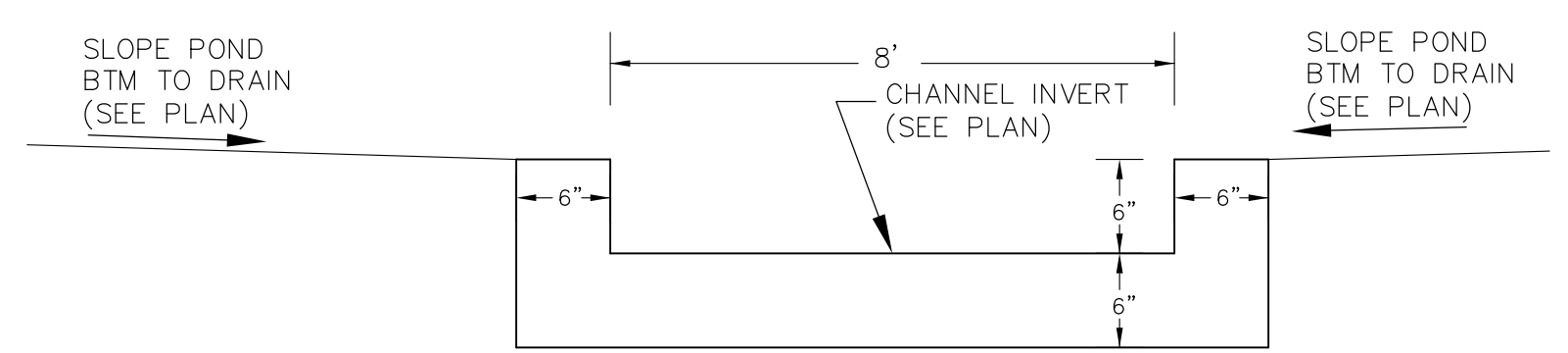
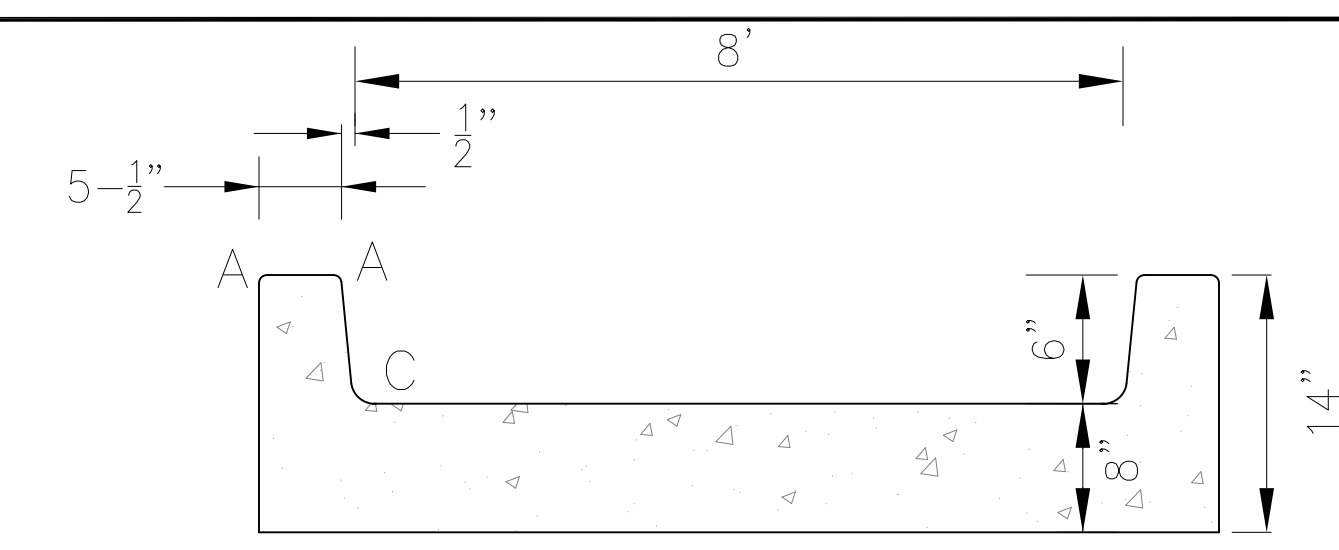
Main stage-storage table with columns: Stage (ft), Optional Override Stage (ft), Length (ft), Width (ft), Area (ft^2), Optional Override Area (ft^2), Area (acre), Volume (ft^3), Volume (ac-ft). Rows include 'Top of Micropool' and stages 5765.33 to 5776.



LENGTH FOR RADII  
 A = 1/2"  
 C = 1-1/2"

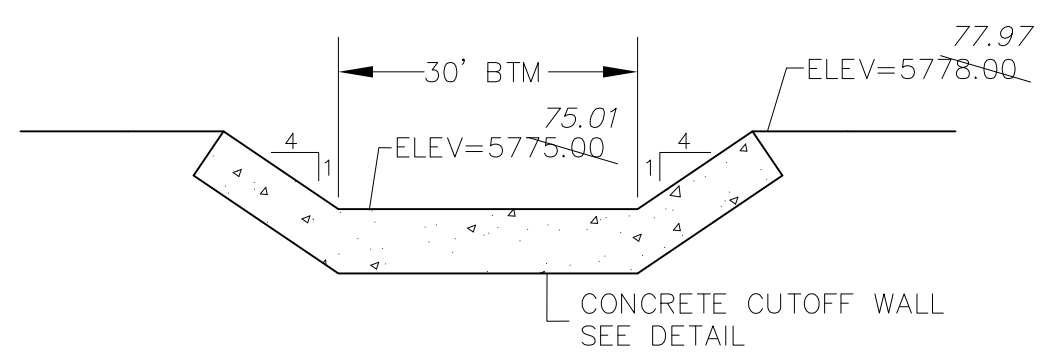


CONCRETE LOW FLOW CHANNEL DETAIL  
 NO SCALE

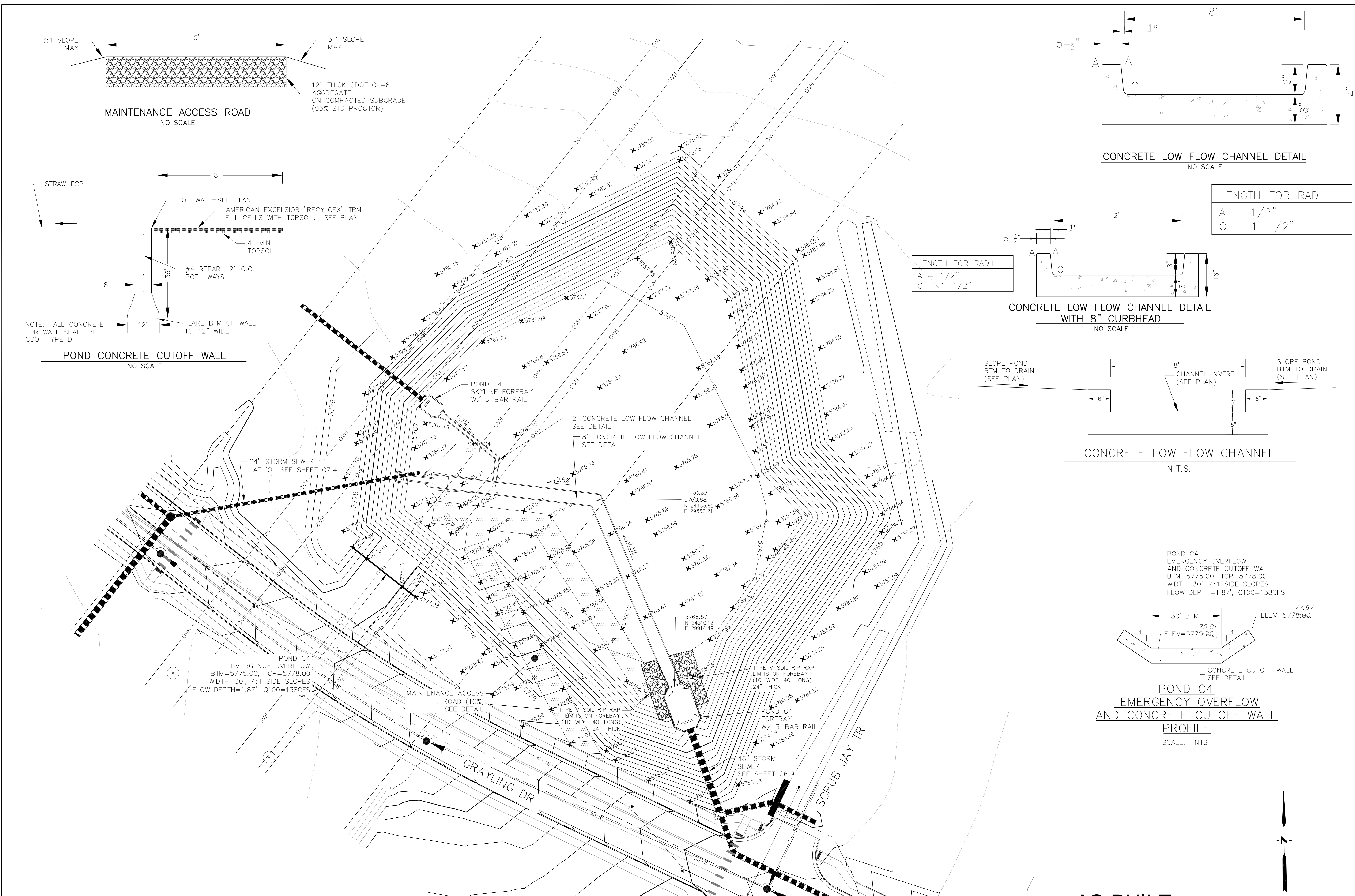


CONCRETE LOW FLOW CHANNEL  
 N.T.S.

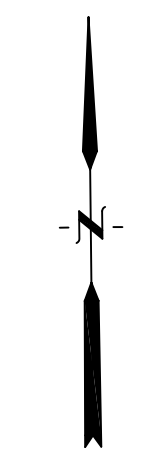
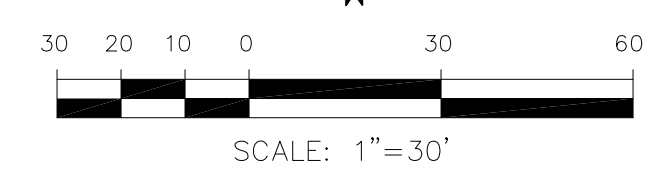
POND C4  
 EMERGENCY OVERFLOW  
 AND CONCRETE CUTOFF WALL  
 BTM=5775.00, TOP=5778.00  
 WIDTH=30', 4:1 SIDE SLOPES  
 FLOW DEPTH=1.87', Q100=138CFS



POND C4  
 EMERGENCY OVERFLOW  
 AND CONCRETE CUTOFF WALL  
 PROFILE  
 SCALE: NTS



AS-BUILT  
 DATE: 09/30/2022



**CORE**  
**ENGINEERING GROUP**  
 15004 1ST AVENUE S.  
 BLDG 719 S701100  
 CONTACT: RICHARD L. SCHINDLER, P.E.  
 EMAIL: Rich@ceg1.com

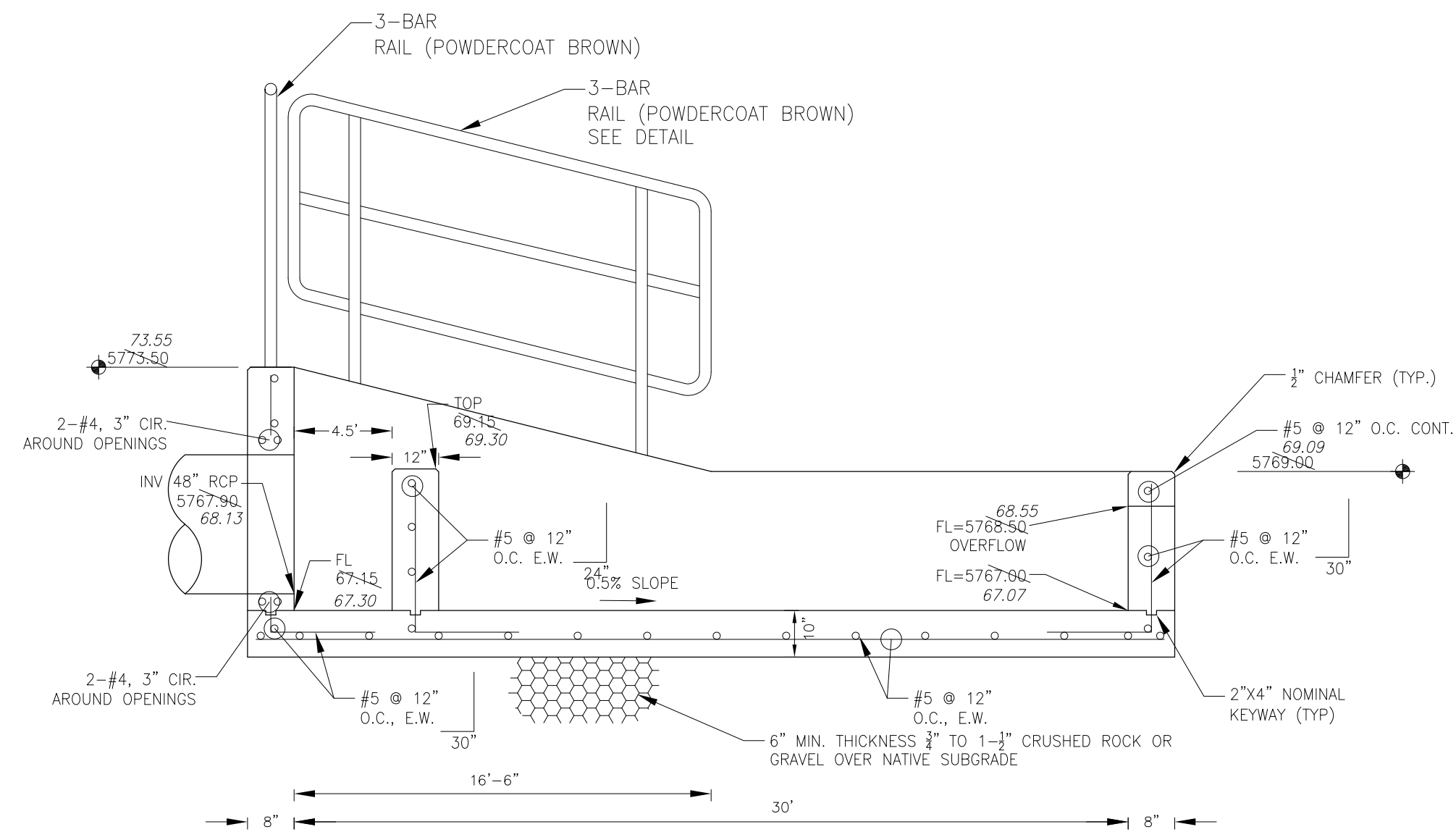
DATE: JAN 12, 2021  
 DESCRIPTION: RAISE SITE 1' EAST OF POWERLINES  
 NO. 1  
 PREPARED FOR: **LORSON, LLC**  
 212 N. WAHSATCH AVE, SUITE 301  
 COLORADO SPRINGS, COLORADO 80903  
 CONTACT: JEFF MARK  
 PROJECT: **THE HILLS COLLECTOR STREET CONSTRUCTION**  
 FONTAINE BLVD. - GRAYLING DR  
 LORSON BLVD - WALLEYE DR - LAMPREY DR  
 COLORADO SPRINGS, COLORADO

DRAWN: RLS  
 DESIGNED: RLS  
 CHECKED: RLS

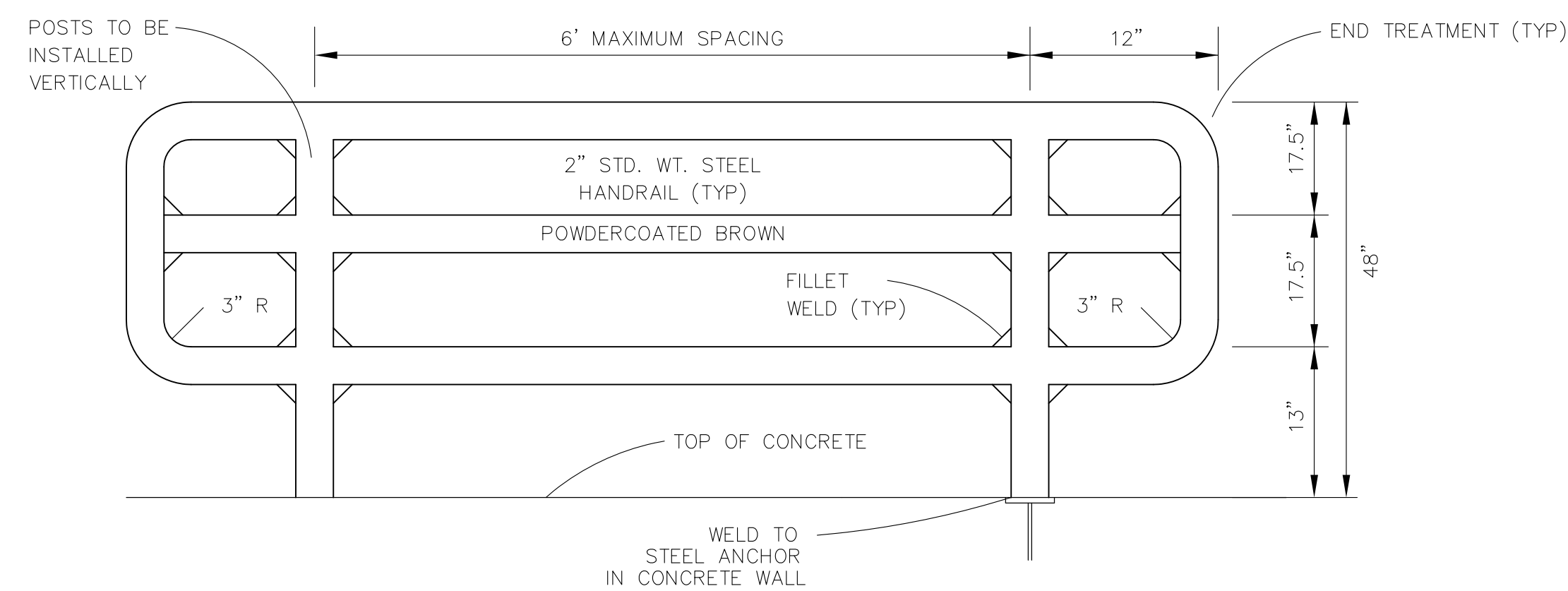
**POND C4  
 FOREBAY & LOW FLOW CHANNEL  
 LAYOUT**



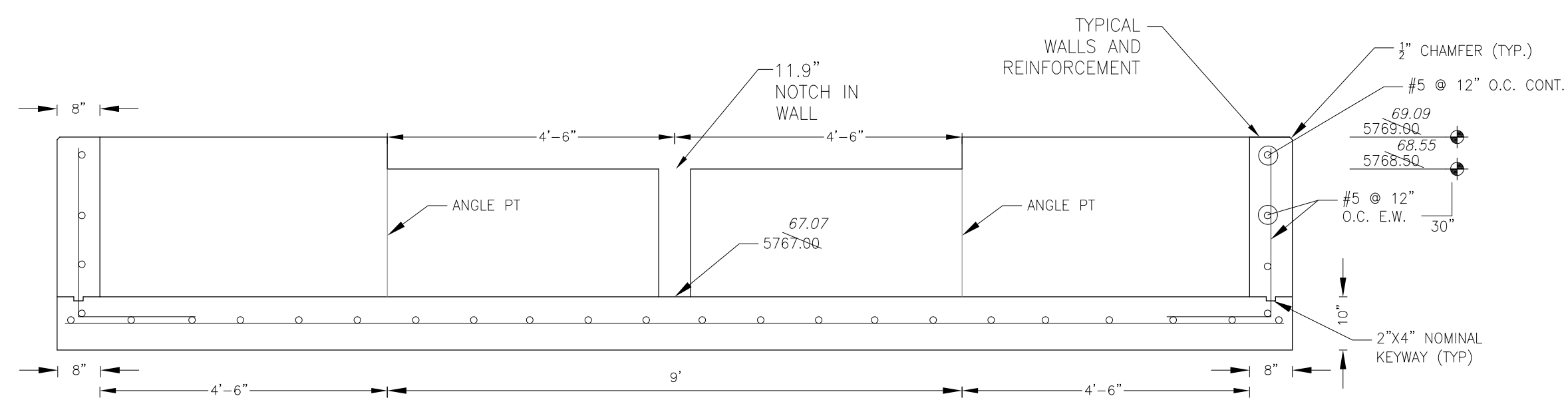
DATE: NOV 12, 2020  
 PROJECT NO. 100.061  
 SHEET NUMBER **C9.10**  
 TOTAL SHEETS: 58



FOREBAY SECTION A-A  
NO SCALE

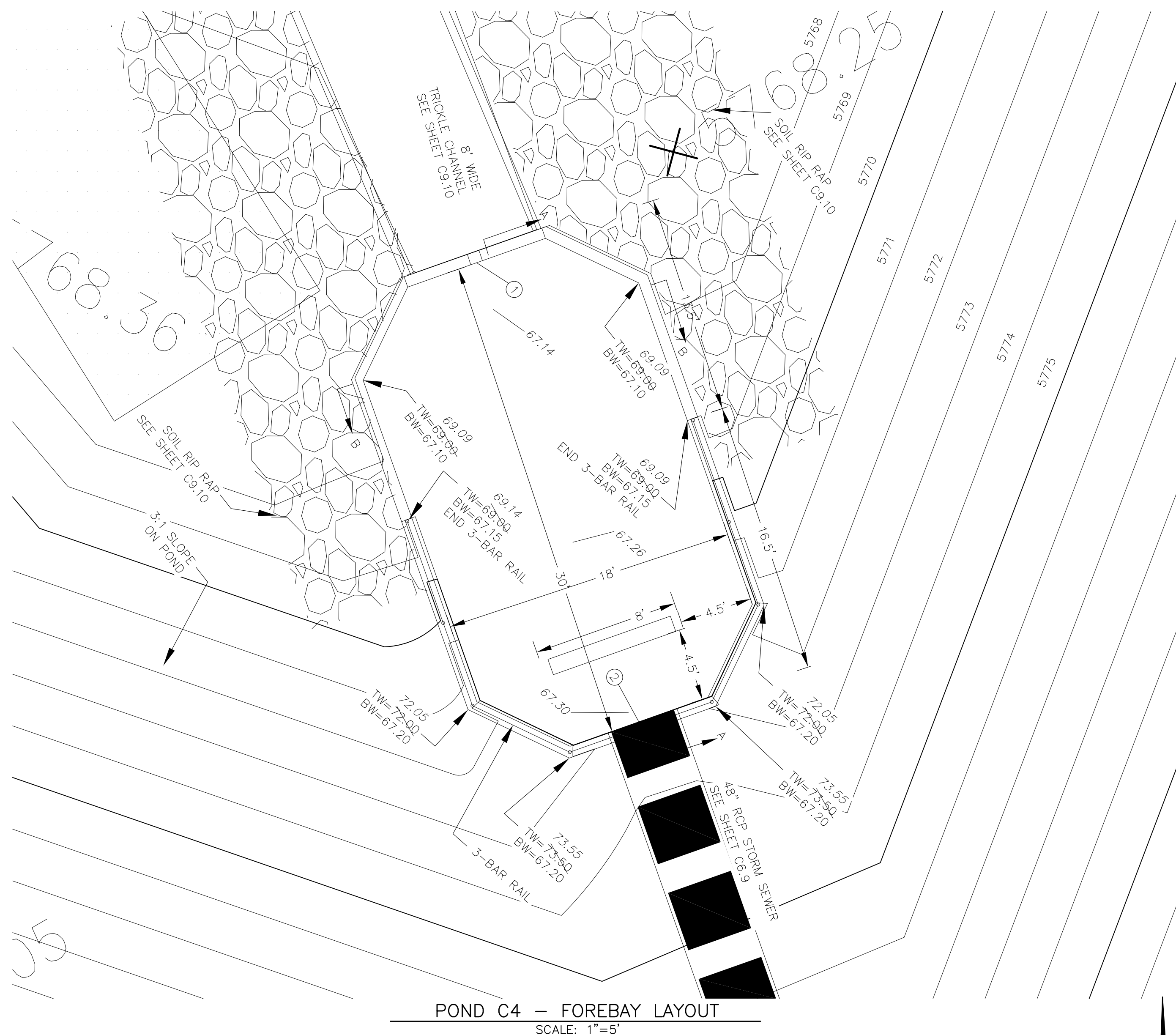


3-BAR RAIL DETAIL  
NO SCALE

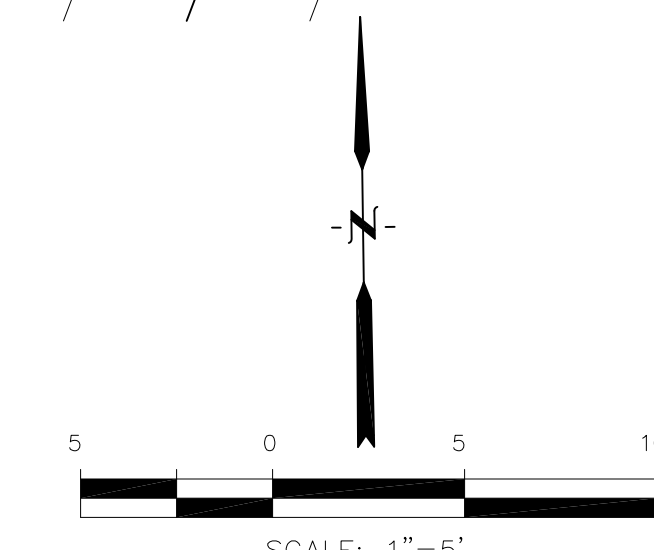


FOREBAY SECTION B-B  
NO SCALE

NOTE: ALL CONCRETE FOR FOREBAY SHALL BE CDOT TYPE D



POND C4 - FOREBAY LAYOUT  
SCALE: 1"=5'



POINT TABLE (FOREBAY)				
NUMBER	NORTHING	EASTING	ELEVATION	NOTES
1	24309.51	29914.77	5767.00	FOREBAY BOTTOM
2	24281.30	29924.99	5767.15	FOREBAY BOTTOM, INV 48"=5767.90

**CORE ENGINEERING GROUP**  
15004 1ST AVENUE, S.  
DENVER, CO 80202  
PH: 719.570.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@ceg1.com

DATE: JAN 12, 2021  
DESCRIPTION: RAISE SITE 1' EAST OF POWERLINES  
NO. 1  
PROJECT: THE HILLS COLLECTOR STREET CONSTRUCTION  
212 N. WAHSATCH AVE, SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
LORSON, LLC  
LORSON BLVD - WALLEYE DR - LAMPREY DR  
COLORADO SPRINGS, COLORADO (719) 635-3200  
CONTACT: JEFF MARK

DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

POND C4  
FOREBAY DETAILS

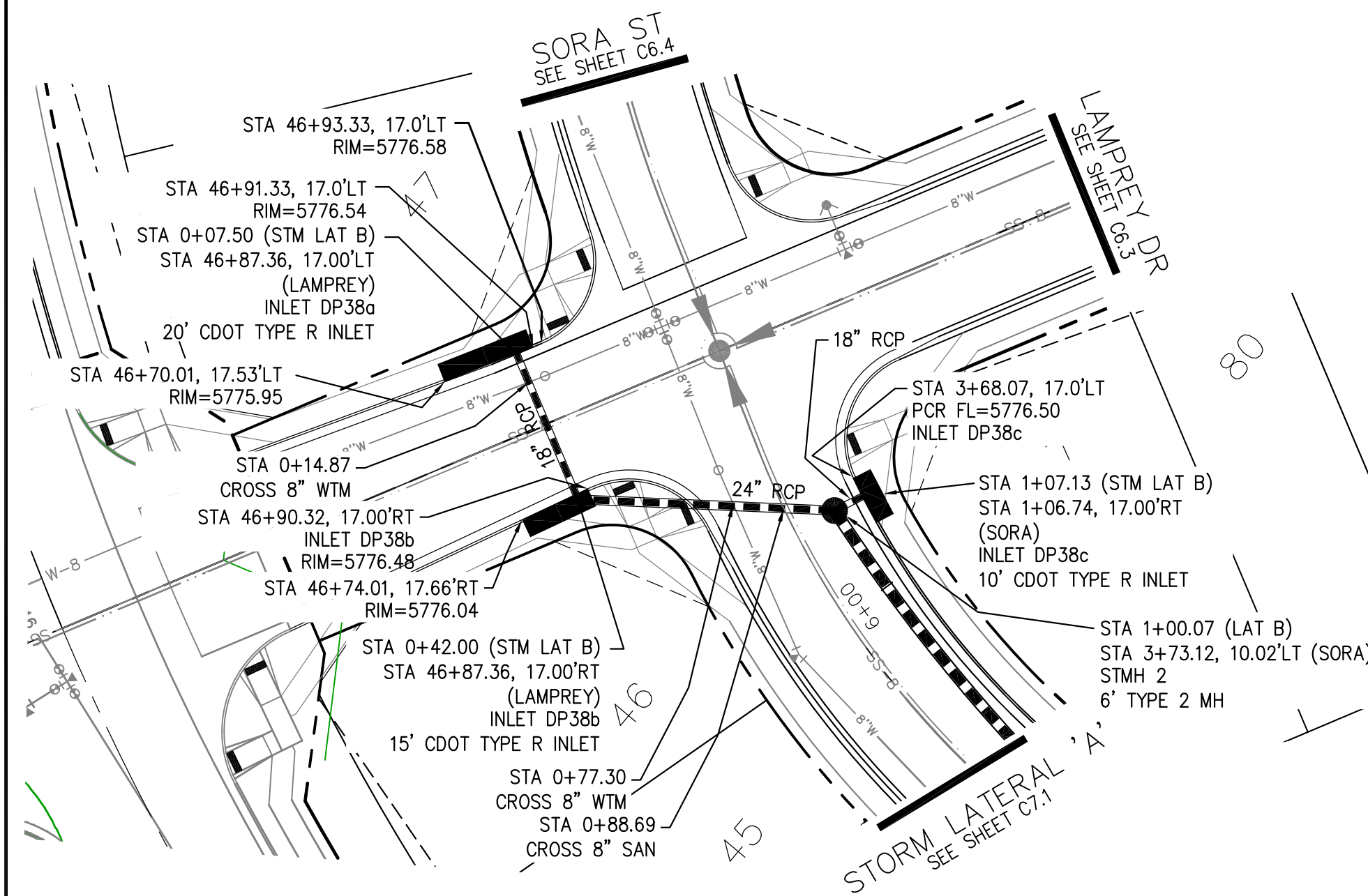
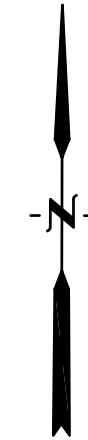
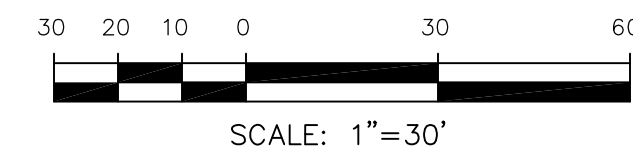


DATE: NOV 12, 2020  
PROJECT NO. 100.061  
SHEET NUMBER C9.11  
TOTAL SHEETS: 58

**AS-BUILT**  
DATE: 09/30/2022

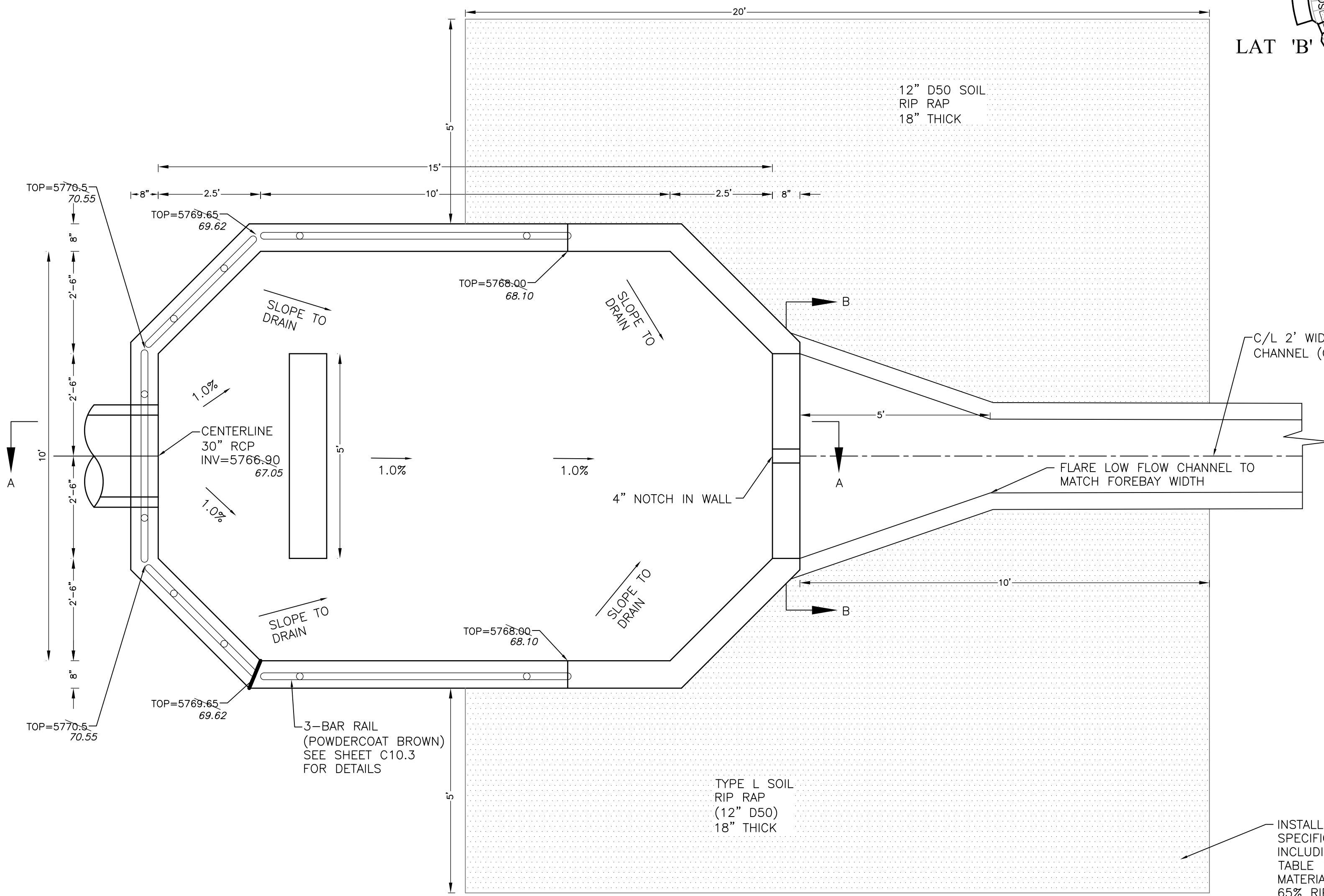
- NOTES**
1. ALL SPOT ELEVATIONS ARE FLOW LINE UNLESS OTHERWISE NOTED.
  2. SEE GRADING PLAN FOR GRADING INFORMATION.
  3. ALL STORM SEWER SHALL BE CLASS III RCP.
  4. ALL MHS SHALL BE TYPE 1 UNLESS OTHERWISE NOTED.

- 1 CURVE DATA ID
- 2 CURB TRANSITIONS
- 3 PEDESTRIAN RAMP, SEE SHEET C10.1

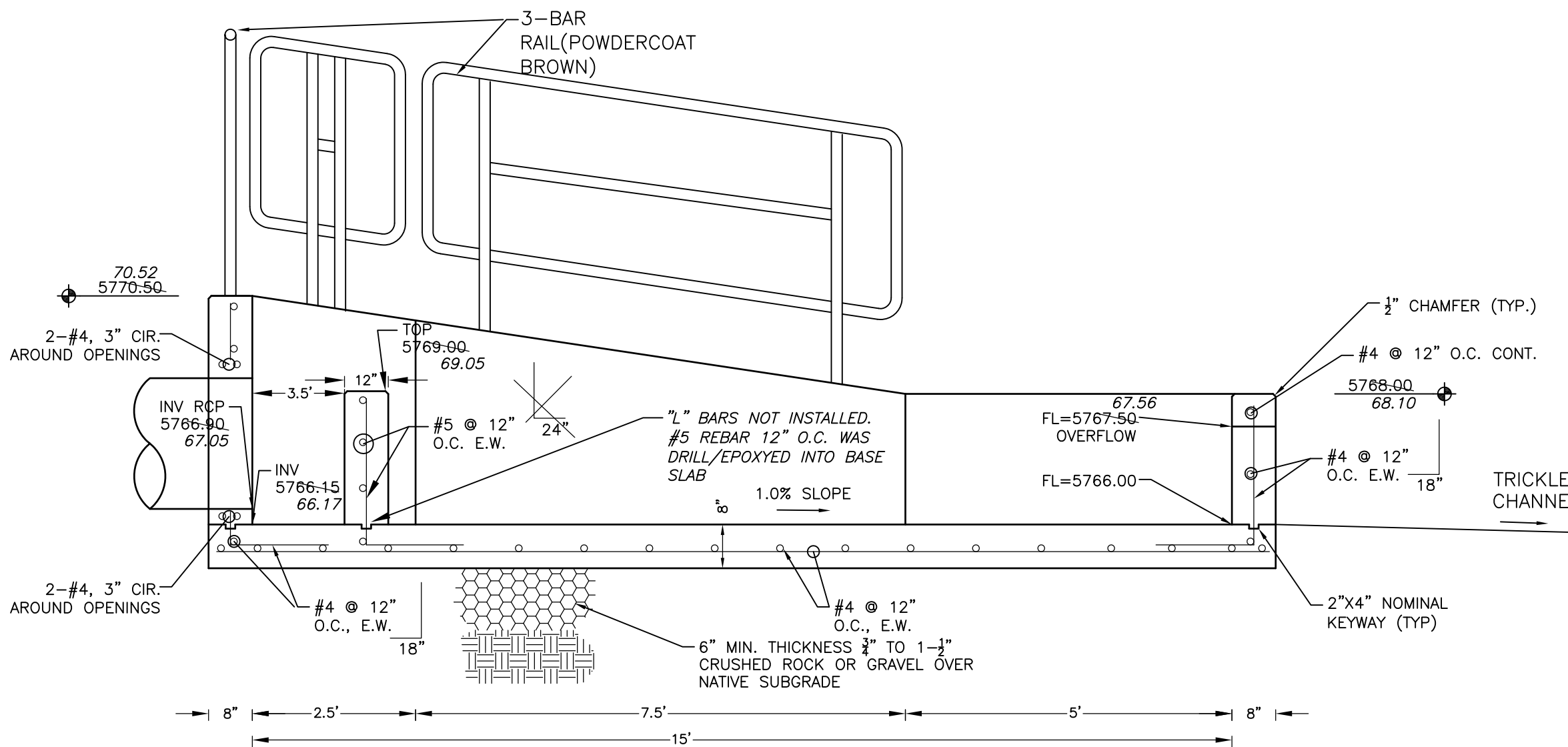


**STORM LATERAL 'B' (PUBLIC)**

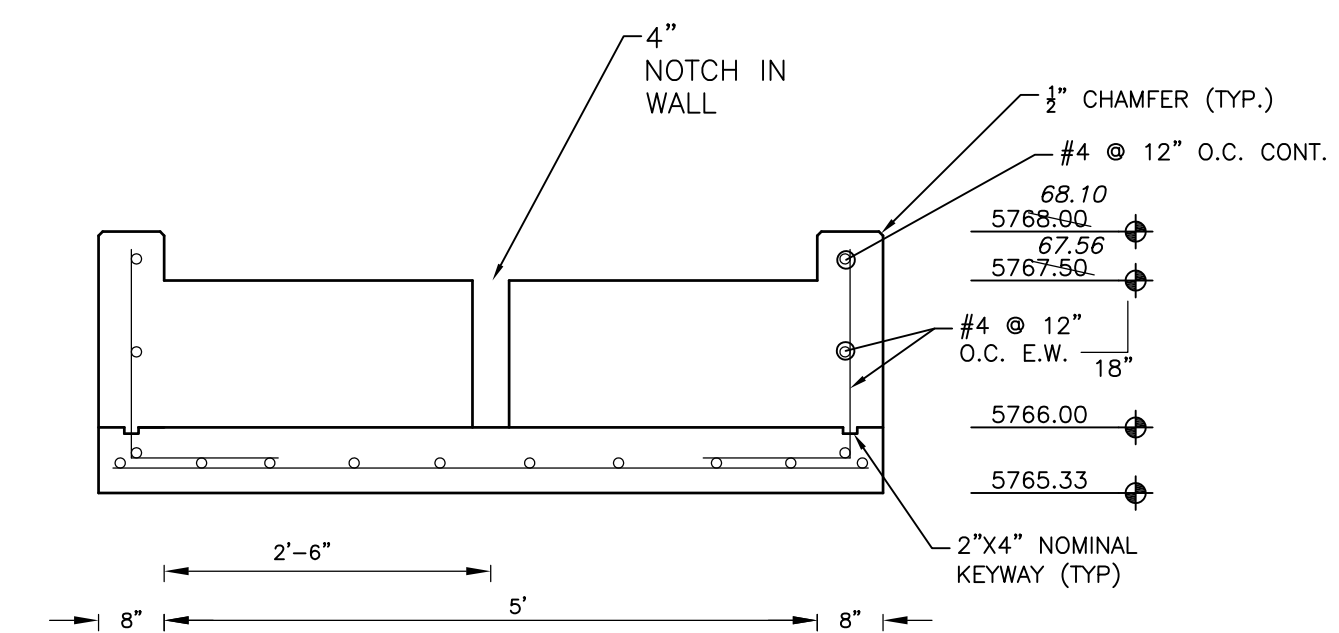
Station	Description	Flow
5795		
5790		
5785		
5780		
5775		
5770		
5765		
0+00	Q5=7.4cfs Q100=15.2cfs	
1+00	Q5=10.2cfs Q100=21.4cfs	
2+00		



**FOREBAY DETAIL**  
NO SCALE

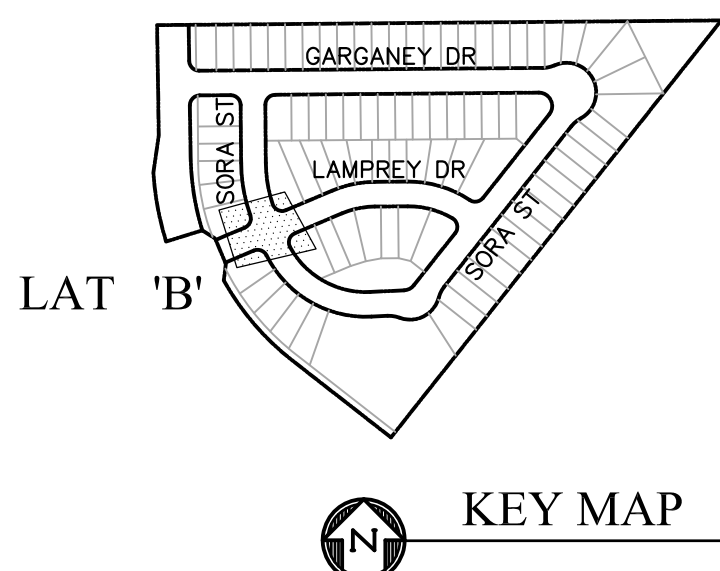


**FOREBAY SECTION A-A**  
NO SCALE



**FOREBAY SECTION B-B**  
NO SCALE

INSTALL SOIL RIP RAP PER MHFD SPECIFICATION SECTION 31-37-00 INCLUDING RIP RAP SPECIFICATIONS IN TABLE 1 OF SAID SPECIFICATIONS SOIL MATERIAL SHALL BE TOPSOIL MIXED WITH 65% RIP RAP AND 35% TOPSOIL BY VOLUME. ALL SOIL RIP RAP SHALL CONSIST OF A UNIFORM MIXTURE OF SOIL AND RIP RAP WITHOUT VOIDS.



**KEY MAP**

**CORE ENGINEERING GROUP**  
15004 1ST AVENUE S, SUITE 301  
BIRMGHAM, AL 35206  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@ceg1.com

**PREPARED FOR:**  
**LORSON, LLC**  
212 N. WAHSATCH AVE., SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
(719) 635-3200  
CONTACT: JEFF MARK

**PROJECT:**  
**SKYLINE AT LORSON RANCH**  
GRATLING DR - LAMPREY DR  
COLORADO SPRINGS, COLORADO

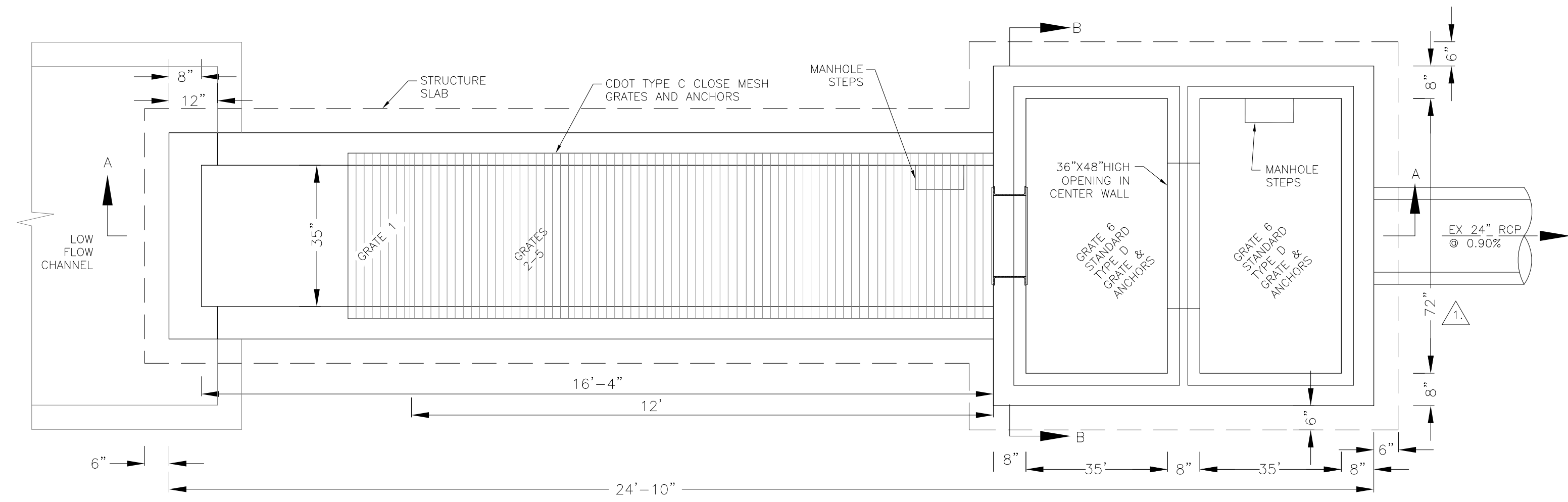
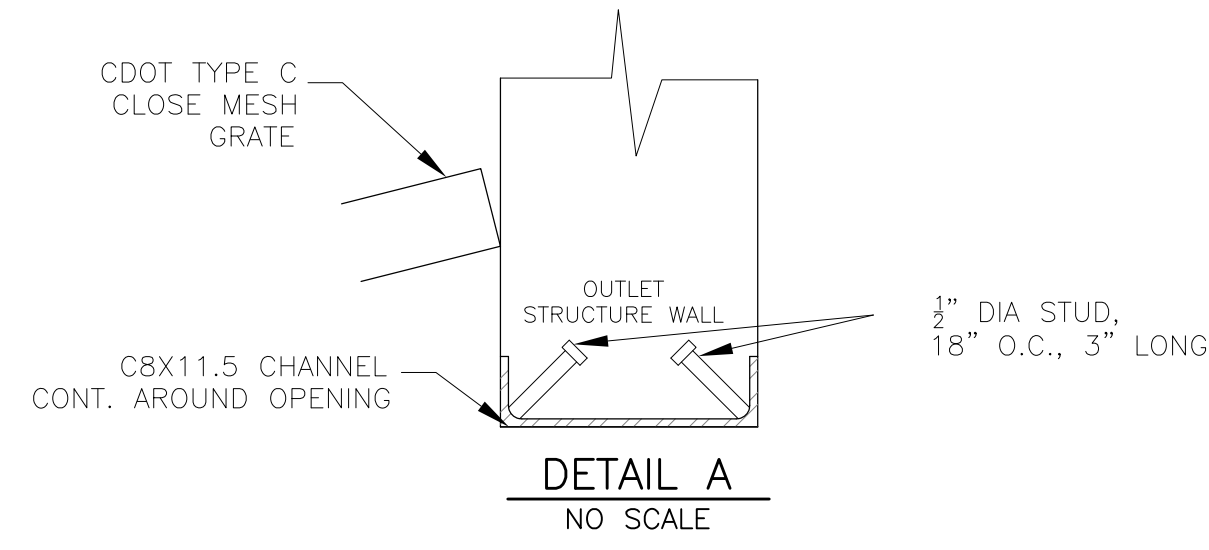
**DATE:**  
MAY 2, 2022

**DESIGNED:** RLS  
**CHECKED:** RLS

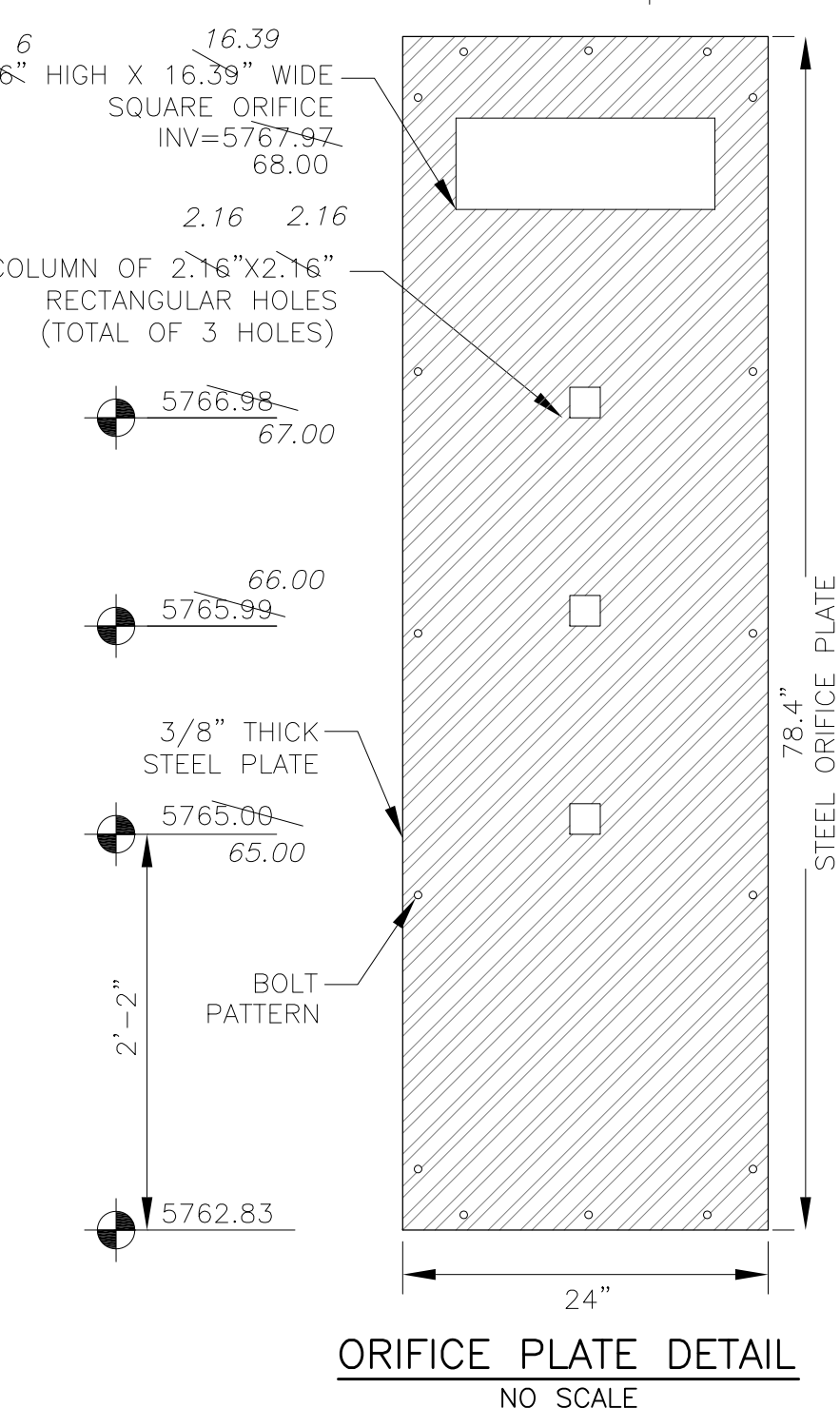
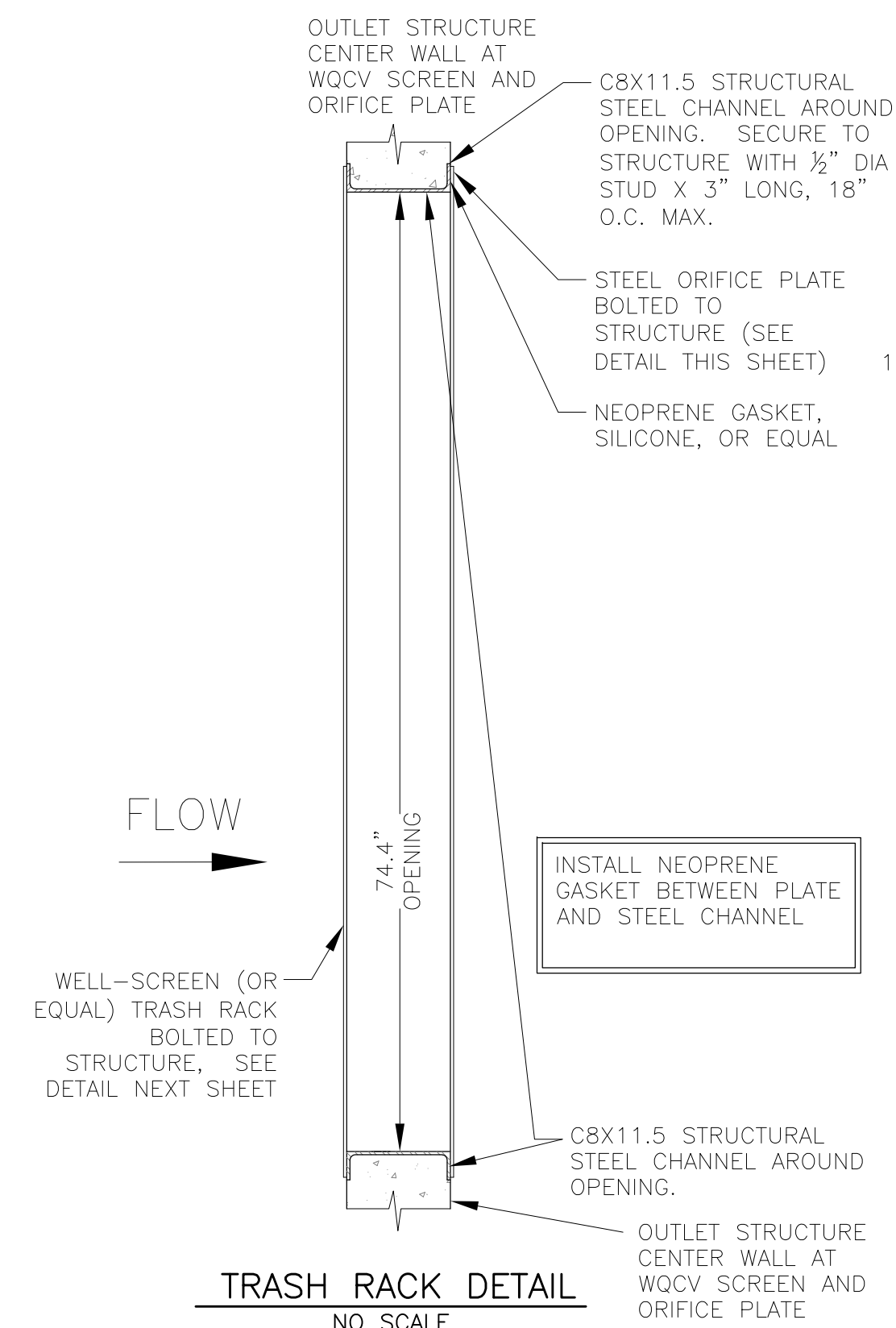
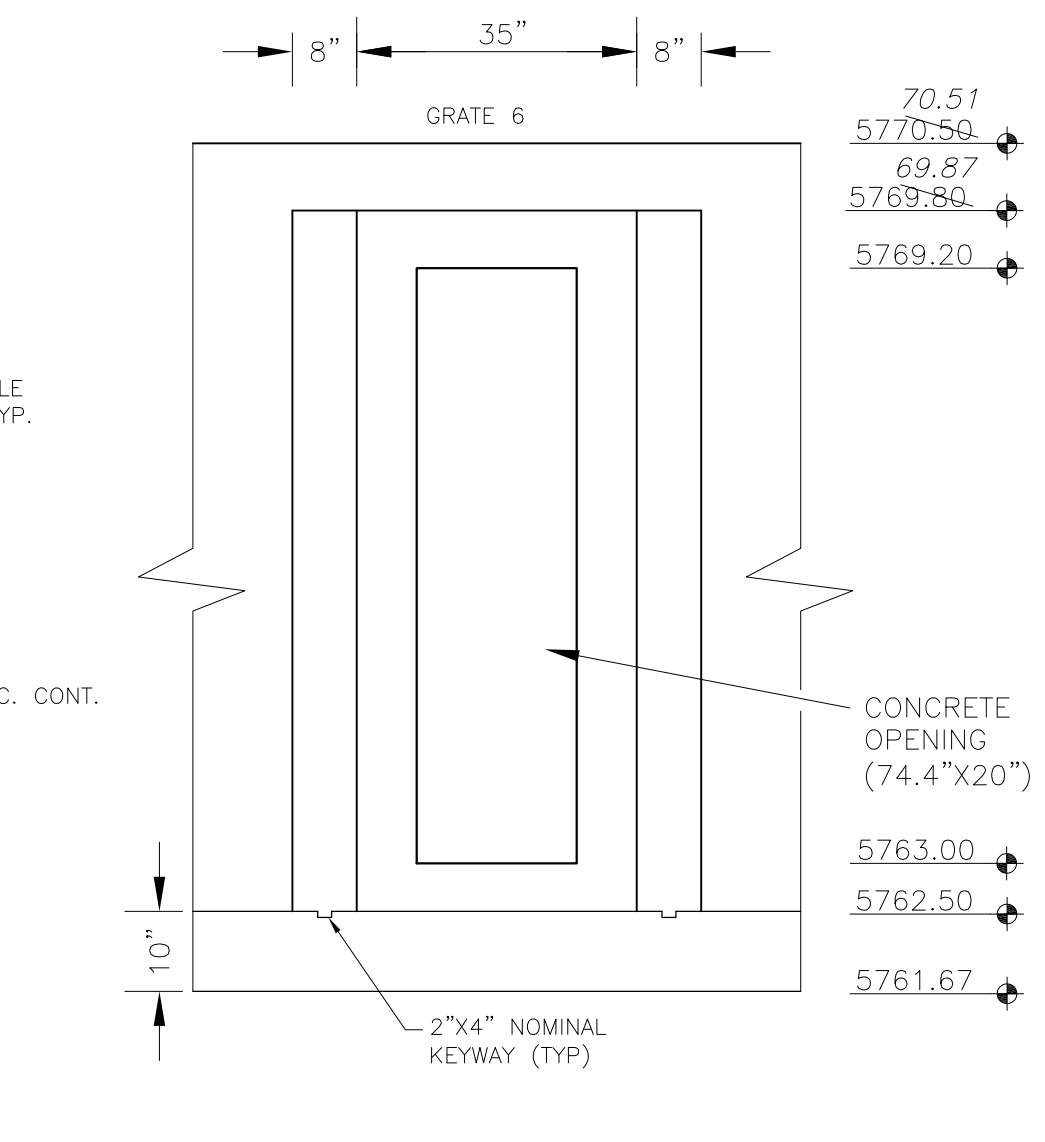
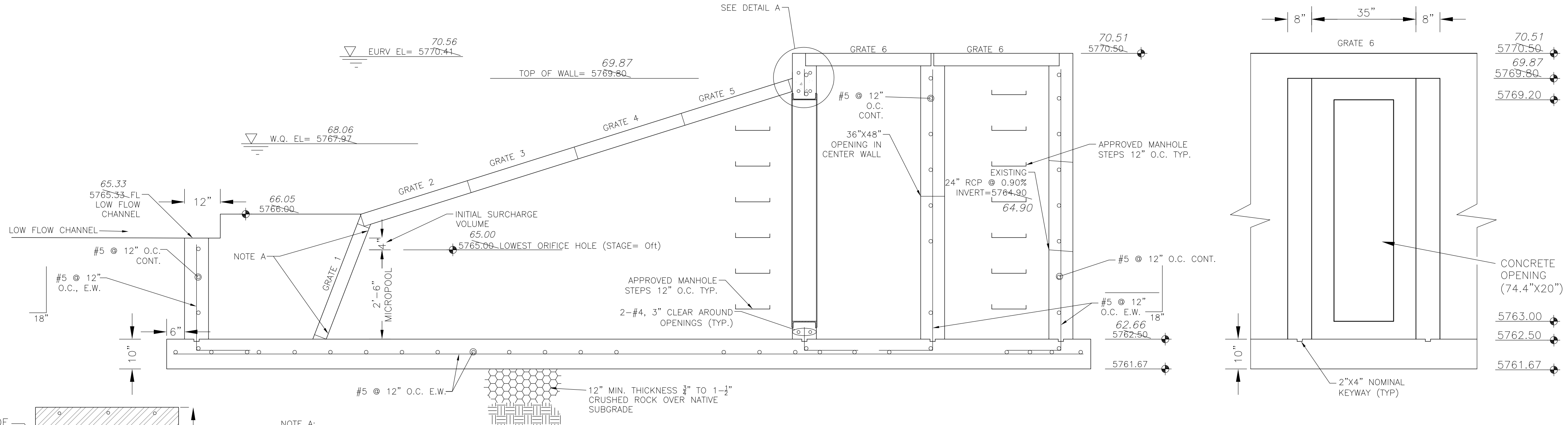
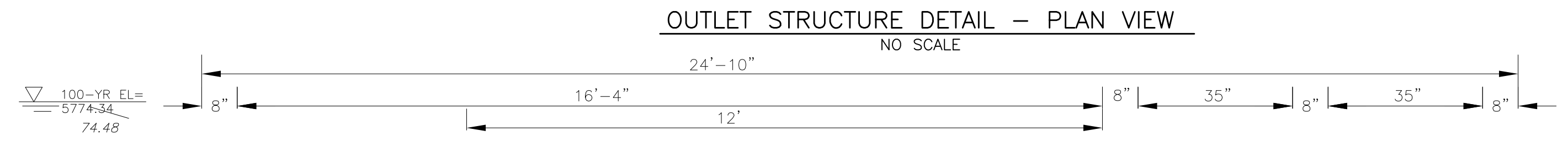
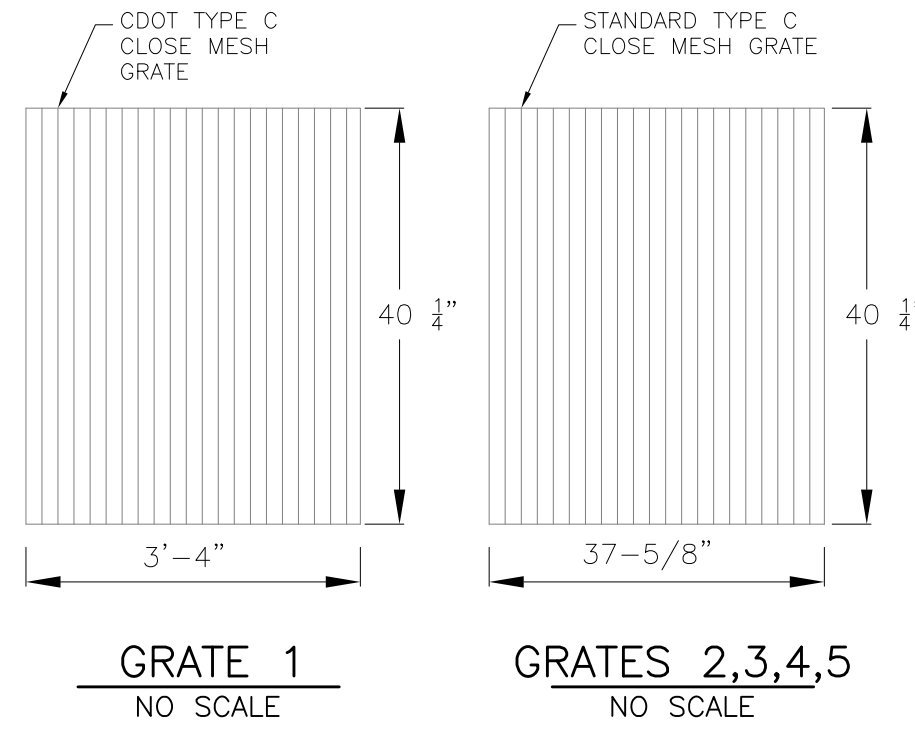
**STORM SEWER LATERAL 'B'  
STORM LATERAL 'B'  
AND SKYLINE POND C4 FOREBAY**

**AS-BUILT**  
DATE: 11/03/2022

**PROJECT NO. 100.063**  
**SHEET NUMBER C7.2**  
**TOTAL SHEETS: 17**



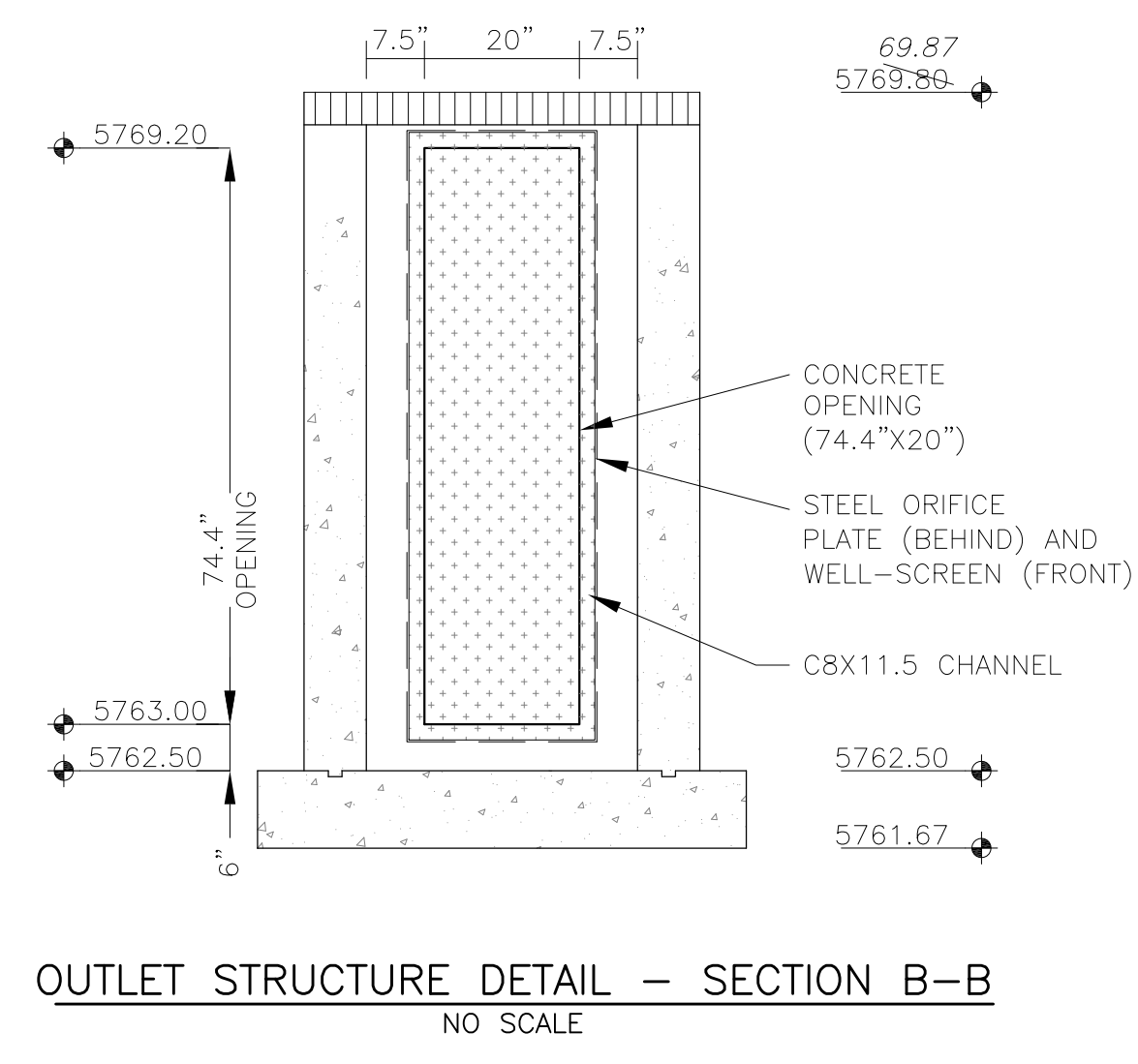
NOTE:  
AFTER CONCRETE STRUCTURE HAS BEEN POURED  
ALL GRATE DIMENSIONS SHALL BE FIELD VERIFIED  
PRIOR TO GRATE CONSTRUCTION



**OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:**

- PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL COMPONENTS OF THE OUTLET STRUCTURE.
  - GRADE 60 REINFORCING STEEL REQUIRED. SEE TABLE FOR THE MINIMUM LAP SPLICE LENGTH FOR REINFORCING BARS. ALL REINFORCING STEEL SHALL HAVE A TWO-INCH MINIMUM CLEARANCE FROM EDGE OF CONCRETE, UNLESS OTHERWISE NOTED.
- | BAR SIZE           | #4    | #5    | #6    |
|--------------------|-------|-------|-------|
| MIN. SPLICE LENGTH | 1'-3" | 1'-7" | 2'-0" |
- CONCRETE FOR THE OUTLET STRUCTURE AND FOREBAY SHALL BE CDOT CLASS D CONCRETE.
  - CONCRETE FOR DRAIN CHANNELS SHALL BE CDOT CLASS B CONCRETE
  - EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M-213. EXPANSION JOINT MATERIAL SHALL BE 1/2" THICK, SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE AND THE JOINT SHALL BE SEALED, REFER TO DETAILS.
  - ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 3/8" CHAMFER UNLESS OTHERWISE NOTED.
  - SUBGRADE TO BE 12" THICK CLEAN FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM M698 UNDER STRUCTURE.
  - REFER TO POND DETAILS FOR PRESEDIMENTATION/FOREBAY DESIGN.
  - ENGINEER SHALL BE NOTIFIED PRIOR TO BEGINNING CONSTRUCTION OF OUTLET STRUCTURE TO SCHEDULE OBSERVATION VISITS FOR STRUCTURES.

- WQCV WELL-SCREEN NOTES:**
- Well-Screen shall be stainless steel and attached by stainless steel bolts along edge of the mounting frame.
  - WQCV Well Screen
    - Type of Screen: Stainless steel #93 Vee Wire (Johnson Vee Wire (tm) Stainless Steel Screen or equivalent with 60% open area)
    - Screen slot opening dimension: 0.139" (Screen #93 Vee Wire Slot Opening)
    - Type and Size of Support Rod: TE 0.074"x0.50"
    - Spacing of Support Rod (O.C.): 1.0 Inch
    - Total Screen Thickness: 0.655"
    - Carbon Steel Holding Frame Type: 3/4" x 1.0" angle



**CORE ENGINEERING GROUP**  
15004 1ST AVENUE S.  
DENVER, CO 80206  
PH: 719.570.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@cge.com

DATE: 3/7/2022  
DESCRIPTION: STRUCTURE WIDTH REVISED TO 72"  
PREPARED FOR: **LORSON, LLC**  
212 N. WAHSATCH AVE. SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
(719) 635-3200  
CONTACT: JEFF MARK

PROJECT: **THE RIDGE AT LORSON RANCH**  
FONTAINE BLVD. - WALLEYE DR  
COLORADO SPRINGS, COLORADO

DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

**POND C4**  
**FULL SPECTRUM**  
**OUTLET STRUCTURE DETAILS**



DATE: NOV 5, 2021

PROJECT NO. 100.064

SHEET NUMBER **C9.5**  
TOTAL SHEETS: 23

**AS-BUILT**  
DATE: 09/30/2022